SCIENTIFIC AMERICAN

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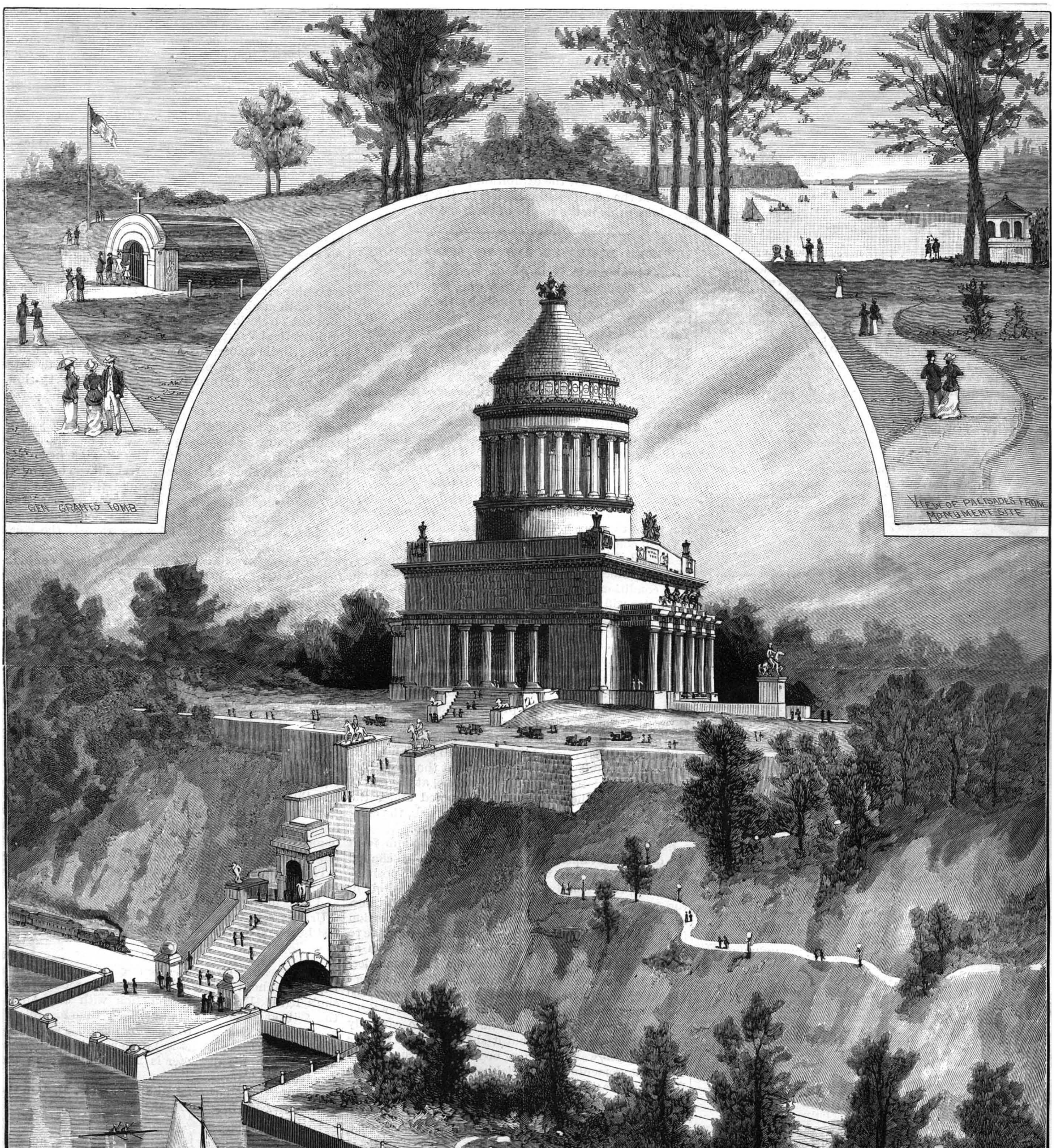

THE GRANT MONUMENT TO BE ERECTED AT RIVERSIDE PARK, NEW YORK CITY.—[See page 277.]

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NEW YORK, SATURDAY, APRIL 30, 1892.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 852.

For the Week Ending April 30, 1892.

Price 10 cents. For sale by all newsdealers.

EXHIBITION OF THE NEW YORK MICROSCOPICAL SOCIETY.

The thirteenth annual exhibition of the New York Microscopical Society took place on the evening of the 22d of April, at the American Museum of Natural History, and, notwithstanding the pouring rain, the enthusiasm of the lovers of microscopy was not damped and the spacious halls were crowded almost to an uncomfortable degree.

Nearly one hundred microscopes were in place, each containing an attractive object. It is obviously impossible to go into the details of the several exhibits, or even to describe the most interesting ones. The display of the instruments themselves was hardly less attractive than the objects exhibited. Among accessory apparatus shown were several forms of microtome, photo-micrographic apparatus, illuminators, various chemicals, and some of the earlier microscopes and microscopical apparatus. While the general exhibition was in progress there were three exhibitions of thirty minutes each in the lecture room at the end of the large hall. These comprised an exhibtion of lantern slides of photomicrographs, an exhibition of lantern slides of diatoms, and a projection of miscellaneous microscopic objects.

Taken altogether, the exhibition proved a great success, and the officers and members of the society may well take pride in the results of their efforts.

ERICSSON'S DESTROYER AND ITS SUBMARINE GUN.

Some trials are to be made, during the latter part of April, of the Ericsson submarine gun, for the testing of which the Destroyer was built by the great inventor in 1878. The little vessel, now lying at the Navy Yard, is 130 feet long, 17 feet wide, and 11 feet deep, and adapted to use a submarine gun of 16 inch caliber and 30 feet long, the muzzle projecting through an opening in the stem, near the bottom. The vessel is designed to be almost totally submerged and have great speed, so that she could approach a hostile vessel with but little danger, discharging her torpedo at a distance of not more than 200 yards from an opponent, at such a depth below the surface of the water that it would not be stopped by the ordinary nettings and would reach the weakest part of the enemy's hull.

Some trials of the gun have been made within a few weeks past at the Erie Basin, but a lighter torpedo was employed than is required for use in actual service, that it might come to the surface at the end of its range and be recovered. The next trials, however, are to be made with torpedoes of the actual service weight, and under such conditions that the line of their passage through the water will be accurately marked. For this purpose the vessel has been brought to the Navy Yard, and the torpedoes will be discharged into the basin of the great timber dry dock, the vessel being stationed a few yards in front of the open gateway of the dock. Nettings are to be stretched across within the dock, at spaced intervals, through which the torpedo will pass, thus marking its path, the pumping out of the dock permitting the recovery of the torpedoes and the definition of the trajectory of each of them. The range at which the gun is designed to be serviceable is only about 200 yards, and it is the intention that the projectiles shall sink, and not rise to the surface, at the end of their course. The nets were constructed under the direction of Commander A. H. McCormack, the chief ordnance officer of the Brooklyn Navy Yard.

Some alterations have been made in the gun from the designs of Captain Ericsson, the principal change being one by which, when the torpedo is in position for firing, the explosive it contains will be entirely in the water section of the gun, beyond the gasket surrounding the torpedo and separating that portion from the inner section. This change has been made to prevent any possibility of a premature explosion as the torpedo leaves the gun. The weight of the projectile is designed to be 1,525 pounds; its length, 27 feet 4 inches; diameter, 16 inches; explosive charge, 300 pounds; propelling charge, 40 pounds. The weight and the balancing of the torpedo have to be carefully looked to in charging it, that it shall have the specific gravity of sea water and may be kept to a true course. The arrangements for the trial have been made by the Ericsson Coast Defense Company, under a contract with the government, and the experiments will be conducted under the supervision of the Naval Torpedo Board, of which Commander G. A. Converse is president.

POSITION OF THE PLANETS IN MAY.

VENUS

is evening star. Even more in May than in April is she first among the planets for her marvelous beauty and brilliancy. She is now retracing her steps toward the great central luminary. Her progress at first only slowly reduces the apparent length of the chain that binds her to the sun. Seen through a telescope at the beginning of the month, she presents the appearance of the moon when one-half of its illuminated surface is turned toward us. At the end of the month she is of a crescent shape like that of the moon when two days past its third quarter. Venus is now moving rapidly toward the earth. This is a more important factor in determining her apparent brilliancy than the diminution of her phase. On the 2d of June she will appear at her brightest. The light number of Venus on May 1st is 142, on May 31st it is 184.

Those who may wish to see Venus with the naked eye in broad daylight should look for her as following the course of the sun and about three hours behind it. When Venus crosses the meridian, which takes place about 3 P. M. throughout the month, she has a high altitude and may be found at about one-sixth of the distance from the zenith toward the horizon.

The conjunction of the moon with Venus takes place at 2 h. 15 m. A. M., May 29th, below the horizon. Venus crosses the meridian about half an hour after the moon on May 28th and about half an hour before the moon on May 29th. On each day at that time she is only about 8 degrees from the moon, mainly in right ascension. As she will then be practically at her brightest, the position of the moon will enable the observer to find Venus readily in daylight. On the evening of the 28th, Venus and the three days' old moon with the bright stars in their neighborhood will form a charming picture.

The right ascension of Venus on the 1st is 5 h. 48 m., her declination is 26° 50′ north, her diameter is 24″.4, and she is in the constellation Gemini, whose length she very nearly traverses during the ensuing month. Venus sets on the 1st at 10 h. 46 m. P. M. On the 31st she sets at 10 h. 21 m. P. M.

SATURN

is evening star. He crosses the meridian the first of the month at about 9 o'clock, at the end of the month at about 7 o'clock. Taken in connection with his more brilliant rival Venus, he will serve to mark the course of the ecliptic among the stars, that path from which the sun and all the planets can only slightly deviate. The motion of Saturn in the ecliptic is very slow. Owing to his great distance from the sun, he passes through but one sign of the zodiac in the course of a year. Since the middle of January he has been retrograding; during May his position will be almost stationary. He may be recognized by the time he crosses the meridian and by his steady red light. The system of rings and eight satellites about Saturn make him the most wonderful member of the solar system. Just now the plane of his rings passes in the neighborhood of the earth, so that the telescope reveals the rings only as a line of light.

The moon, five days before the full, is in conjunction with Saturn on the 6th, at 6 h. 47 m. P. M., being 2° 2′ north.

The right ascension of Saturn on the 1st is 11 h. 41 m., his declination is 4° 43′ north, his diameter is 17″.8, and he is in the constellation Virgo.

Saturn sets on the 1st at 3 h. 12 m. A. M. On the 31st he sets at 1 h. 12 m. A. M.

URANUS

is evening star. He crosses the meridian on the 1st at 11 h. 20 m., on the 31st at 9 h. 18 m.

Uranus is a star of the sixth magnitude and not easily recognizable under ordinary conditions.

The moon occults Uranus on the morning of May 10, being in grocentric conjunction at 4 h. 32 m. A. M. But this occultation will not be visible in New York, as moon and planet will be below the western horizon. Nor will the approach of the moon to the planet present any special interest, on account of the low altitude and the near approach of daylight.

The right ascension of Uranus on the 1st is 14 h. 7 m., his declination is 12° 16′ south, his diameter is 3″.8, and he is in the constellation Virgo.

Uranus sets on the 1st at 4 h. 37 m. A. M. On the 31st he sets at 2 h. 39 m. A. M.

NEPTUNE

is first evening star and then morning star. He is lost throughout the latter part of the month in the sun's light. He is in conjunction with the sun on the 29th at about 1 P. M., at which time his role of evening star changes to that of morning star. His right ascension on the 1st is 4 h. 25 m., his declination is 20° 7′ north, his diameter is 2″.5, and he is in the constellation Taurus.

Neptune sets on the 1st at 8 h. 47 m. P. M. On the 31st he rises at 4 h. 29 m. A. M.

MARS

is morning star. There is little of interest in his May course. He rises the earliest of the morning stars. His distance from the earth and his low altitude prevent his being of value for purposes of observation.

The moon is in conjunction with Mars on the 17th at 1 h. 37 m. P. M., being 3° 5′ south.

The right ascension of Mars on the 1st is 19 h. 59 m., his declination is 22° 8′ south, his diameter is 11″.5, and he is in the constellation Capricornus.

Mars rises on the 1st at 12 h. 37 m. A. M. On the 31st he rises at 11 h. 26 m. P. M.

JUPITER

is morning star. He is now so far away from the sun

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that he may be seen in the early dawn. He rises in advance of the sun about one hour the first of the month and about two hours the last of the month. He is at nearly his average distance from the earth, but monthly coming nearer.

The moon is in conjunction with Jupiter on the 22d at 2 h. 45 m. P. M., being 1° 48′ south.

The right ascension of Jupiter on the 1st is 0 h. 40 m., his declination is 3° 10′ north, his diameter is 32″.4, and he is in the constellation Pisces.

Jupiter rises on the 1st at 3 h. 47 m. A. M. On the 31st he rises at 2 h. 4 m. A. M.

MERCURY

is morning star. The position of this rapidly moving planet, interior to all so far known, confines it to the immediate neighborhood of the sun. On the 31st of March Mercury was at its greatest eastern elongation of 19° 3′. On May 17 it will be at its greatest western elongation of 25° 39′. It will not be visible this month, as its light number is small and its low declination, compared with the sun, will permit it to rise but an hour in advance.

The moon is in conjunction with Mercury on the 24th, at 8 h. 36 m. A. M., being 2° 42′ north.

The right ascension of Mercury on the 1st is 1 h. 32 m., his declination is 7° 49′ north, his diameter is 10″.8, and he traverses during the month the constellation Aries.

Mercury rises on the 1st at 4 h. 21 m. A. M. On the 31st he rises at 3 h. 33 m. A. M.

A PARTIAL ECLIPSE OF THE MOON

will take place on May 11, of which the end, but not the beginning, can be seen in the eastern section of the country, the moon rising eclipsed. The middle of the eclipse is at 5 h. 53 m. P. M., when ninety-six one-hundredths of the moon's diameter is in shadow. The eclipse will be mainly over when the moon rises in New York, at about seven o'clock, although the moon does not leave the earth's shadow until 7 h. 37 m. P. M. The moon leaves the penumbra at 8 h. 53 m. P. M. The line of demarkation to be seen in an eclipse of the moon is not so sharp as is seen in an eclipse of the sun, nor is the moon ever wholly invisible when eclipsed, because it is never entirely free from the sunlight refracted to it by the earth's atmosphere.

"Poisoned" American Apples.

BY C. V. RILEY.

Since Miss Eleanor Ormerod's success in convincing English horticulturists of the value of spraying with arsenicals against the Codling moth, and of its harmlessness when properly done, opposition to the use of Paris green has taken a new form in England. It is now contended that American apples are unsafe to use because, in the language of one English journal, "arsenic . . . is used upon the fruit itself until it is completely saturated, . . . and what is not absorbed by the skin remains on it, forming a fine coating, which must evidently be detrimental to health, especially where the fruit is consumed to any extent."

I have seen no such disparaging statements concerning English apples, though, as they are now beginning to spray English orchards after the American fashion, it would seem that the native fruit must soon be as dangerous as the American product. The report is most likely to have been started by importers interested in retaining for Australian and Tasmanian apples the market now so largely occupied by American fruit. Any lingering doubts as to the safety of using Paris green in water suspension were so long ago dispelled from the American mind that the revival, at this late date, of this absurd scare has something childish in it.

In spraying for the Codling moth the proportions usually observed are one pound of the poison, either Paris green or London purple, to 150 gallons of water. It is difficult to arrive at any exact estimate of the amount of arsenic deposited on a tree when sprayed with this mixture, but if five gallons of the wash are used upon an ordinary tree (and this is an outside estimate of the amount required), $\frac{1}{30}$ of a pound, or say 0·53 of an ounce, of the poison will be left upon it, of which perhaps one-fifth will go upon the young apples themselves, the foliage and limbs receiving the rest.

We should therefore have a fraction more than one-tenth of an ounce of poison left upon the *fruit* of an apple tree when five gallons of spray are used. In circular No. 1 of the Division of Entomology, I have recommended that the first spraying be done on the falling of the blossoms, the apples being about the size of peas, and that a second application be made about a week or ten days later. These two sprayings, at the rate of five gallons of wash per tree each time, will therefore put a little more than one-fifth of an ounce of poison on the *apples*, each apple presumably receiving an equal share of the amount. The quantity of poison upon each apple is therefore very minute to begin with. But between the last spraying and the gathering of the crop three cleansing influences are at work—rain, heavy dew, and the natural growth of the apple, each of which removes a part of the very small quantity originally sprayed upon it.

If, however, the garnered apple be supposed to have retained a part of its small share of the poison originally sprayed upon it, such poison can have remained in only two places—the calyx and stem ends. Elsewhere it must have been blown off by the wind upon the drying of the spray, washed off by the rain, or rubbed off in handling. If the apple be eaten raw, the calyx and stem ends are precisely the parts which are almost invariably thrown away with the "core," and this is equally true of the fruit if cooked. So that of the minute quantity of arsenic sprayed upon each apple in spring, only an infinitesimal portion, if any, can possibly remain upon it in the autumn, and that upon the very parts which are not eaten.

The statement quoted above that the fruit is "completely saturated" with arsenic is no less absurd than the rest of the article. Arsenic, in the form in which it is used, is a mineral poison not soluble in water, and as sprayed upon trees is simply *suspended*, and undergoes no chemical change. It can no more be "absorbed" through the skin of the apple than any other finely divided mineral substance. For example, where an apple tree is exposed to the dust of a road-side, it could hardly be claimed that its dusty fruit would be gritty or of earthy taste *inside* the skin.

In a recent lecture at the Lowell Institute in Boston, in touching incidentally upon this subject, I made the statement that a man would have to eat many barrels of apples in order to get enough arsenic to poison him. I reiterate that statement here, and as no specific case of poisoning from eating the American apple has yet been recorded, we may dismiss the case against it until the indictment is more closely drawn.

Destruction of Locusts in Tunis.

No. 5, vol. ii., of the *Indian Museum Notes* contains a reprint of an interesting report by Mr. R. Drummond-Hay, British Consul-General to Tunis, on the methods of destroying the locusts which invaded that country in 1891. They made their first appearance in February of that year, and Mr. Drummond-Hay formulates the following rules to be observed on the first appearance of flying locusts:

1. To carefully observe the flights and mark the ground selected for hatching purposes.
2. To employ watchmen to give notice when the hatching days commence.
3. To organize in the meantime gangs of laborers.
4. To destroy the eggs either by gathering them or by plowing up the hatching grounds.
5. To collect the necessary fuel around the contaminated spots.
6. After hatching, to take advantage of the first five days to destroy the young locusts before they form into columns.

Enormous quantities of the eggs were gathered, over 60,000 kilogrammes having been collected in the "kaidats," or districts, of Susa, Djemel, and Mehedia; 76,000 dekaliters at Medenine, 6,800 dekaliters around Gabes, and 2,700 around Gafsa.

Migration commences on the sixth or seventh day after hatching, and the infested country is then divided into sections, with a civil or military officer at the head of each section, and a certain number of soldiers and native laborers are placed under his command. The Zaghouan and Fahs districts, for example, were divided into five sections, with a captain and five lieutenants in charge of the work, and a force of 720 men, with a reserve of 220 men for special service. The line of defense extended over 35 miles along the cultivated plains, and in the early part of July, when the migration was at its height, 25 miles of screens of the Cyprian pattern were in position, and the sections were supplied with 500 yards of zinc for traps and 40 barrels of asphyxiating oil. Oil of creosote 40 parts to water 60 parts was found the best application for killing the trapped locusts, the creosote having some deodorizing properties and diminishing the stench from the dead insects. Carbolic acid in the proportion of 20 parts of the acid to 80 of water was also used with success, and is somewhat cheaper than the creosote oil.

The method of using the screens is the same as that in Cyprus, a column of marching locusts being headed off by the erection of screens with openings of five yards, across which semicircular ditches are dug. The edges of the trenches are covered with projecting strips of zinc, to prevent the insects from crawling out, and the process of asphyxiation by the application of the chemicals mentioned is very rapid. The campaign at Zaghouan and Fahs is considered to have been successful, and it has been calculated that 600 cubic meters of locusts were destroyed by traps in those sections.

The Banana Trade.

Among the most attractive features to those passing along the lower portion of New York City's water front are the East River piers occupied by tropical fruiters, where the steamers lie discharging cargoes of delicious bananas. From one side of a steamer gangs of men carry the bananas to the waiting truckmen on the pier, while on the opposite side of the fruiter lies a large float, on the deck of which, receiving their loads, are railroad cars especially constructed for carrying bananas in good condition to different parts of the United States. While this is almost a daily occurrence, Sundays excepted, there are probably but few who are familiar with the manner in which the banana is cultivated and of the extensive proportions this productive industry has assumed during the past few years. In the first stage of cultivation the "suckers," as they are termed, are planted, and in one year after the tree bears fruit; each sucker produces from two to four trees, each of which bears one bunch of bananas yearly.

Four years ago H. Dumois & Co. purchased thirty-five square miles of land in Banes, Cuba, which at that time was a dense forest, and there were only ten inhabitants in the whole district. Through indomitable energy and enterprise and a sufficient amount of capital, they began the arduous work of clearing away the forest and putting the land in a proper state for agricultural purposes and making improvements. Level roads, ranging from 60 to 100 feet in width, have been laid out so that carriages can be driven over the entire plantation. The company has built a three foot gauge railroad ten miles long and an extension of eight miles is now in progress. They have also built a pier 300 feet long from the hard native woods, and have a saw mill and water works. E. George & Co., of New York, received the contract and furnished the materials. In making these improvements the company adopted the most modern means and spared no expense in not only furthering the growth of Banes, but in order to make it a credit to the island of Cuba. One thousand five hundred men are employed on the plantation during crop time, and Banes has at present a population of 3,500, which shows the rapid progress that has been made, and it bids fair to be one of the finest and most thrifty ports in Cuba, besides the most important fruit center in the world. Banes is a beautiful port, favorably situated on the Bay of Banes, which is six miles wide and eight miles long. The entrance to the port is three miles long but very narrow, being at some points only 150 feet wide, but having 16 to 20 fathoms of water at the narrowest points.

The company has about one-half the entire land cleared and 9,600 acres planted with bananas—2,400,000 fruit-bearing trees. There are twenty-six steamers in the banana trade plying between Cuba and New York all the year round. H. Dumois & Co. control nine large, stanch, and commodious steamers especially constructed for their trade, and they run from Banes to Pier 13 East River, which pier the company has leased. Between the months of April and July a steamer arrives at New York almost daily, and during the busy season each steamer will discharge her cargo, which averages 12,000 bunches, and depart the same day in ballast. The demand for bananas has reached such large proportions that H. Dumois & Co., who control the entire banana crop of Banes, will this year export from Banes to the United States about 1,500,000 bunches. The steamers of this company are each of about 700 tons and bear the following names: Alfred Dumois, Simon Dumois, George Dumois, Hipolyte Dumois, Banes, Henry Dumois, Albert Dumois, Gurly, and Holquin. The four last mentioned are the latest addition to the fleet. The Henry Dumois and the Albert Dumois are 12½ knot boats and the Gurly and Holquin are twin screw steamers of the latest type.

When it is taken into consideration the brief period (only four years) since H. Dumois & Co. commenced clearing away the wilderness, it may be said, and not only tilling the land but building an entire town, streets, stores, dwellings, and a railroad, and giving employment to the inhabitants in cultivating enough bananas to keep nine steamers running the year round, in supplying the demands for that nutritious fruit, it is wonderful to contemplate, and it is an accomplishment that has probably never been excelled. —*Am. Ship Builder.*

The Stealing of Electricity Theft.

The Engineering News says that according to a St. Louis decision the stealing of electricity is a misdemeanor in the eyes of the law. A hardware dealer with some knowledge of electricity placed a fine wire across the connections to his meter and caused it to register in a certain time about 320 amperes less than was actually used. When brought to trial, his lawyer interposed the ingenious defense that as at common law electricity was unknown, and could not, under the code, be made a subject of larceny, and as no statutory law had been passed making it a felony or misdemeanor to steal electricity, for the reason that its character was not known, and that it was not subject to asportation as personal property, his client could not be convicted of larceny. It was, however, shown by the prosecution that gas, also unknown at common law, was nevertheless something whose larceny was recognized by the law as a misdemeanor. When the attorney for the defense interposed the plea that the act in question was fraud or deception instead of a larceny, the judge took advantage of the Missouri statute, which makes fraud perpetrated with a view to theft a felony, and set the defendant's bail at $5,000.

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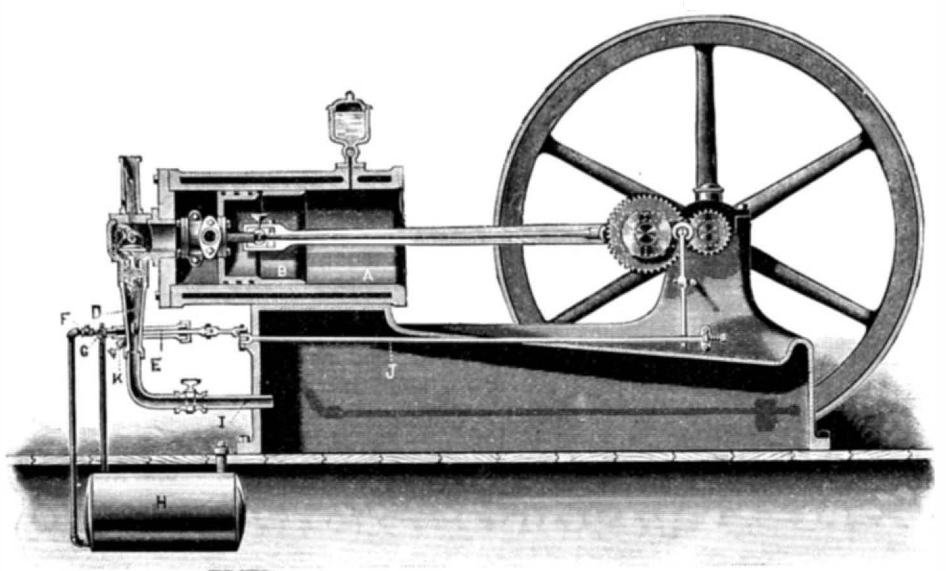
AN IMPROVED GAS ENGINE.

The facility with which an engine run by gas or gasoline can be set up and run in almost any location, being always ready for work, yet costing nothing for attendance and not using any fuel except when it is at work, always carries great weight in aiding the introduction of these most convenient motors. The Improved Charter gas engine, shown in perspective and in section in the accompanying illustrations, is for gasoline, coal gas, natural gas, or producer gas, and it has been perfected by years of experience, until it is deemed to be about as simple and effective as it is possible to make such an engine. In its construction all weak and delicate parts have been avoided, making it economical, automatic, safe and clean, while it is, as with all engines of its class, always ready for work. It develops full power at once and does not increase insurance, while the cost of running is in exact proportion to the work done. The supply tank, as will be seen, is lower than the engine, so that as soon as the latter stops work the oil in the pipe flows back to the tank. The engine will work equally well on manufactured or natural gas, calling only for the attachment of a gas valve and requiring no change in the engine. As to the economy of its work, the engine uses only one gallon of 74° gasoline in ten hours to the indicated horse power when doing full work. The price of the gasoline varies from 7 to 13 cents per gallon, according to the quantity bought and location of the purchaser, but with an average price of ten cents a gallon, the cost of running the engine would be only one cent per hour for each indicated horse power. The engine is so simple in construction and operation that an unskilled hand can always see at a glance whether it is working right and give it all the attention needed.

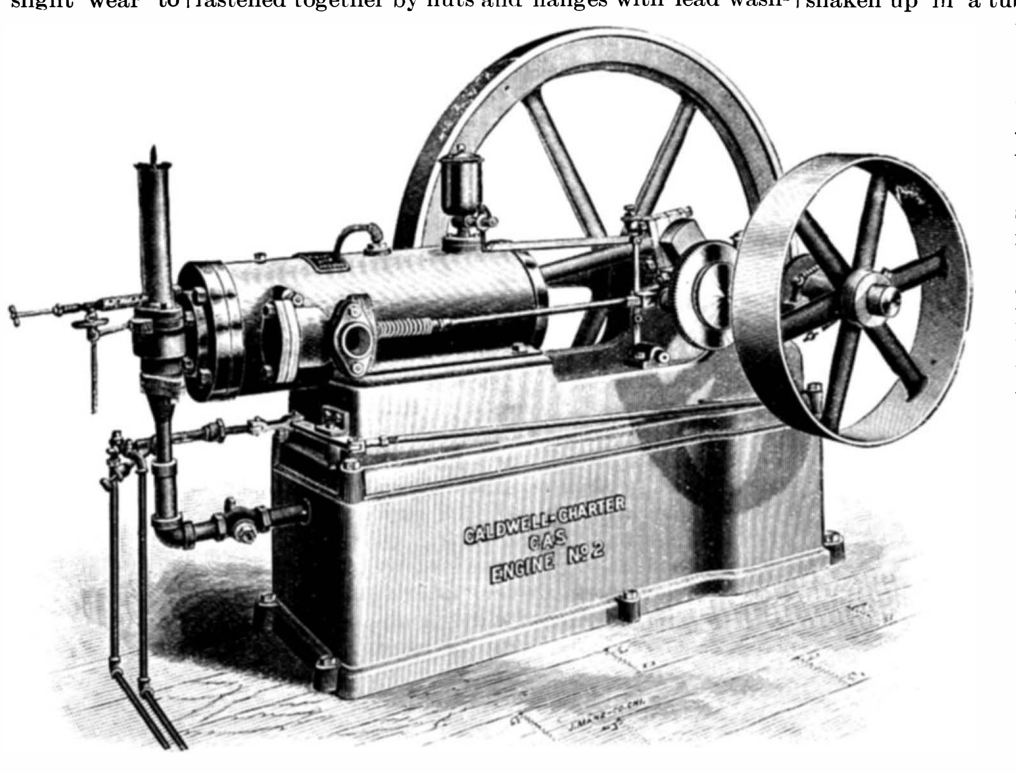


THE IMPROVED CHARTER GAS ENGINE—SECTIONAL VIEW.

Instead of attempting to govern the exact charges of gasoline, which has proved so difficult because so delicate in engines, the Improved Charter engine is so constructed that a simple pump draws from the tank a charge of gasoline much greater in quantity than is required for carbureting the present charge of air. The pump remains open or at its outstroke during the time the air is being drawn into the cylinder past the nozzle or pipe. This pipe or nozzle is connected to the gasoline chamber in the pump, and the throttle valve so regulates the gasoline that the air can only carry a fixed quantity with it. The gasoline which remains in the pump and its valve chamber is immediately forced out of the way of the nozzle in the air pipe, and the surplus returned to the tank. In this way all delicate regulation is avoided. It will readily be seen that should there be any slight wear to the pump mechanism, such wear will not affect the working of engine, as the quantity of gasoline will always be more than sufficient to supply the small amount needed.

In the sectional view, A is the cylinder, B the piston, C the inlet valve to cylinder, D mixing chamber, E is gasoline pump, F and G check valves, one opening inward, the other outward, H is the gasoline supply tank, I is the air suction pipe, J is a connecting rod coupled to the gasoline pump and operated by the governor, K the supply regulating valve. The oilers are automatic, requiring no attention except filling of cups, and the construction insures perfect and permanent alignment of engine. All wearing parts are of materials best suited for service required.

The sole manufacturers are H. W. Caldwell & Son, Washington and Union Streets, Chicago, Ill.



THE IMPROVED CHARTER GAS ENGINE.

How to Draw Microscopical Objects.

There has always been a certain amount of difficulty attending the use of the camera lucida or Beale's neutral tint reflector for the above purpose. The twisting of the head into an uncomfortable position, the great fatigue to the eyes, and the by no means easy task of viewing both image and pencil at the same time, add to the troubles of making a faithful likeness of the object on paper.

To those especially who do not possess a camera lucida or Beale's instrument, and to microscopists generally, I recommend the following arrangement of ordinary apparatus: The microscope body is placed in a horizontal position, and the mirror removed from its substage attachment. The microscope slide having been placed on the stage, the illuminant (lamplight for choice) is "condensed" on the slide by means of a "bull's eye" in the same way as for photomicrography. Care must be taken to "center" the light. The concave mirror is then attached to the front of the eyepiece of the microscope by a piece of thin wood or a spring, and has its surface at an angle of about 45° with the plane of the anterior glass of the ocular. The image is thus projected on to the paper beneath. No distortion will occur if the outer ring of light is perfectly circular. A dark cloth, such as photographers use, is thrown over the draughtsman's head, and also the body of the microscope, and all light excluded save that through the microscope lenses. Any section can thus be easily, rapidly, and comfortably drawn, and accurate representations of objects magnified up to 500–600 diameters can be obtained.—*A. Hopewell Smith, in Jour. Br. Dental Asso.*

Fluorine.

BY HENRI MOISSAN.

I was the first person to obtain the element fluorine in a state of purity, and this I did for the first time in the year 1887. Since then I have considerably enlarged and improved my apparatus, which is now capable of turning out 160 cubic inches of the gas an hour. I obtained this result by passing a strong current of electricity from twenty-six or twenty-eight Bunsen batteries through hydrofluoric acid in which was dissolved a metallic compound, to increase the conductivity. Every part of the apparatus is constructed of platinum with stoppers of flourspar, through which pass the wires conveying the current. The purifying vessels, tubes, and connections are also of the same metal, fastened together by nuts and flanges with lead washers, which, when acted on by the escaping gas, expand and seal any leak.

The tube in which the generation takes place is kept at a temperature of −9° F. by the evaporation of a very volatile organic liquid contained in an outer vessel, and the first member of the purifying series at −58° F. by the same means; the greatest care having to be taken that even the vapor of the refrigerating liquid does not enter any part of the apparatus, or else violent explosions occur.

Fluorine gas is of a yellow color, with a smell resembling bleaching powder. Every precaution has to be used in studying its action on other bodies, both on account of its dangerously irritating action on the eyes and mucous membrane of the operator and its marvelous energy, far exceeding that of anything hitherto discovered. There is hardly a gas, liquid, or solid that it does not attack, usually, with the greatest violence; in fact, its mere contact with any other substance is nearly always signalized by the sudden evolution of intense heat and light and loud detonations.

As a supporter of combustion, fluorine leaves oxygen far behind. Lampblack bursts immediately into brilliant flame and gets red hot in a current of fluorine gas, and charcoal is made to give an interesting exhibition of its porosity, by first filling its interstices with the gas and then burning spontaneously with sparkling scintillations. The diamond, however, is able to withstand its action, even at high temperatures. Silicon, a crystalline substance closely resembling the diamond, gives a very beautiful reaction, showers of brilliant spangles being scattered in all directions from the white hot crystals, which are finally melted. As they do not fuse under 2,190° F., some idea can be formed of the immense energy set free during the combination.

All the metals, with the exception of gold and platinum, are rapidly attacked by fluorine, and even those in less degree. Iron combines in the cold with splendid energy, becoming white hot; and rust, when heated, behaves in a similar manner. Zinc, if slightly warmed, bursts into gorgeous luminosity, accompanied by bright white flames, so intense as to be almost blinding. Mercury is attacked violently in the cold. I once attempted to pass a quantity of the gas into a tube standing over mercury protected by an inert fluid; but when inclining the tube, the two elements came into contact, there was a violent detonation, and the containing vessels were broken to atoms; with silver very little action occurs until 212° F. is reached; at a red heat, however, incandescence is observed, the product melts, and, on cooling, has a sheen like satin. Gold, on heating, forms a volatile fluoride which, when carried to a slightly higher temperature, splits up again into the metal and the gas.

The behavior of liquids with fluorine is usually very energetic, and experiments have to be conducted with much caution. If the gas be passed into the middle of alcohol, the result is very striking; the whole mass is violently agitated, and each bubble, as it appears, becomes incandescent in the middle of the liquid, finally vanishing in flame. If a few drops of chloroform are shaken up in a tube full of fluorine gas, a violent explosion takes place, and the tube is reduced to fragments.

Hydrogen combines fiercely with fluorine, even in the dark, and at −9° F., the issuing stream burning with a blue flame, bordered by red. In every other known case, heat or some form of extraneous energy is required to induce the combination of elementary gases. Oxygen is one of the few bodies that appear to have no affinity for fluorine. Even when they are heated together up to 932° F., nothing is observed to take place between them. If a few drops of water are placed on the floor of the experimenting tube and fluorine gas is passed in, a dark fog is seen surrounding each drop, which presently clears and resolves itself into a characteristic blue vapor, apparently more than an inch in thickness, and which is found to be that most interesting condensed form of oxygen—ozone—in a state of great density.—*Annales de Chimie et de Physique.*

Pomona Electric System.

The power plant of the San Antonio Light and Power Co., of Pomona, will be one of the most interesting in the country.

The power plant will be located, it is said, in the San Antonio canyon, about 15 miles distant from Pomona. At this point is a fall of some 425 feet, with a minimum flow of water of about 1,300 cubic feet per minute, or, approximately, 1,000 hydraulic horse power. This water power will be somewhat expensive to develop, as it is necessary to build a tunnel 1,300 feet long through a spur of San Antonio Peak, which is practically of solid rock.

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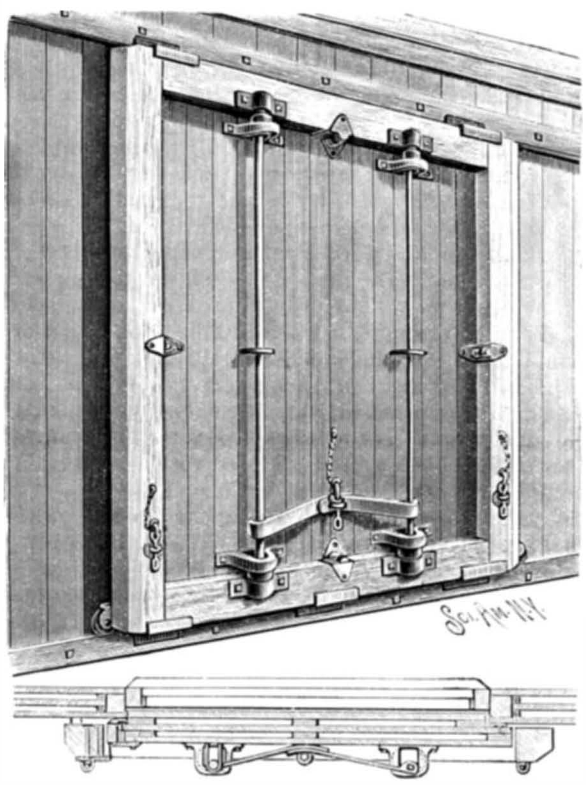
AN IMPROVED CAR DOOR.

The illustration represents a door of simple and durable construction, which may be readily opened and closed, and is designed to be absolutely air and water tight when closed. The improvement is more especially for use on refrigerating, fruit, box, and other cars, affording perfect protection to the contents of the car. It has been patented by Messrs. Manly T. Carson, of Jackson, Tenn., and James D. Gurganus, of Whistler, Ala. The door frame has shoes or rollers to facilitate readily moving it to or from the car door opening, and in the frame slides a panel to close the opening, the panel having on its inner face an offset fitting on to a rabbet in the door opening, as shown in the sectional plan view. The panel is movably supported in the frame by a series of tongued and grooved castings secured to the inner edges of the frame and the outer edges of the panel, the pan l being put in place in the frame before the car door is hung on the side of the car. To conveniently give the desired sliding motion to the panel, eccentrics are secured on vertical shafts turning in suitable bearings in the front of the frame, these eccentrics engaging straps on the front face of the panel, so that when the shafts are turned, the panel is moved inward or outward to or from the door openings. Hasp arms on the shafts are adapted to engage a staple on the front of the panel, by which the latter may be locked in closed position, there being a staple at each side of the frame for the engagement of the arms when they are swung outward in opening the door. The inner edges of the panel are formed with a packing to be pressed in contact with the door casing, a similar packing being arranged on the inner face of the offset abutting against the rabbet



CARSON & GURGANUS' CAR DOOR.

of the door opening, whereby the panel h rmetically seals the door opening and makes an air and water tight joint. The panel may be moved in th frame without unlocking the latter from the side of the car, and the interior of the car may be ventilated as desired without entirely opening the door.

The Filer Objects.

If there is one thing more than another that disturbs the equanimity of the average genius who pr sides over the filing department of the saw mill, it is carelessness on the part of the laborer who removes the bark from the hardwood log, and does not carefully remove old iron projections from the same, invites death to the workmen, destruction to the mill, disaster to the proprietor and demoralization to the saw by his lack of cautiousness.

The *Timberman* recently picked over a pile of hitching post pins and rings, horse nails, iron slabs and wedges, horse shoes and what not, that had been removed from walnut logs at the mill of the Lesh, Prouty & Abbott Co., of East Chicago, Ind., or had been discovered when too late to save the saw in use, and damaged this instrument when it bit into the stranger in its progress through the timber. During the writer's visit to the mill named, and but for the fact that the *Timberman* would have been a witness to the murder, the filer would doubtless have brained the careless Pole who chopped the end off a nail with his ax in taking the bark from a walnut log, but failed to remove the larger portion of the nail from the log, as he should have done before sending it to the logroll.

The band saw is a costly instrument. It is usually made of excellent material, and the filer expends much labor in adjusting it to the work at hand, but he does not fix it to cut iron, hence his indignation when his pet saw is injured, or perhaps utterly destroyed, because of the carelessness or indifference to the possible consequences from an attempt to cut iron. Serious accidents are frequently recorded as resulting from the unfortunate contact of the saw with a wedge or similar instrument found buried in a log, but in most instances these mishaps can be averted by a watchful eye. The price of a band saw, which is about $50, is itself enough to suggest the greatest watchfulness on the part of all concerned in placing the timber before the saw.

A few days ago, while a saw was singing through an ash log at the Copenhagen mill in Xenia, Ohio, a clanging sound was heard, which alarmed the population of the place, and when the cause of it was discovered, it was found that every tooth of the large saw in the mill mentioned was gone, leaving nothing but a round piece of steel. It had struck something hard in the center of the log, and when split open, buried in its very heart was found an iron wedge which the saw had cut in two. The log was 2½ feet through, and the wedge had been in the tree evidently for as many as fifty years. In this case there was nothing on the surface that would indicate that anything was inside, and besides, there was not enough left of the saw to cause the filer to mourn the possibility of his being obliged to reconstruct it, but the mill men who faced death for a brief moment fell to their knees in thankfulness for a favorable result, notwithstanding the proprietor lost $115 by the mishap.

The Columbian Exposition.

Inventors and manufacturers who may desire to exhibit goods, tools, etc., at the World's Columbian Exposition should take note of the following summary of the rules and regulations:

There are no charges for space, and a limited amount of power will be supplied gratuitously. All show cases, cabinets, shelving, counters, fittings, countershafts, pulleys, belting, decorations, signs, etc., must be at the expense of the exhibitor, and conform to the general plan adopted. No single piece or section of greater weight than 30,000 pounds will be accepted, if machinery is required for its installation. The expense of transportation, receiving and arranging exhibits and removal at the close of exposition shall be paid by the exhibitor. Exhibitors may insure goods and employ watchmen, subject to certain regulations.

The installation of heavy articles, requiring foundations, should, by special arrangement, begin as soon as the progress of the work on the buildings will permit. The reception of articles will begin November 1, 1892, and no article will be admitted after April 10, 1893. Space not taken possession of April 1, 1893, will revert to the Director-General for reassignment. Exhibits intended for competition must be so specified, or they will not be examined for award. Articles that are in any way dangerous or offensive, also patent medicines, nostrums and empirical preparations where ingredients are concealed, will not be admitted, and any article dangerous or detrimental will be removed. Exhibitors will be held responsible for the cleanliness of their exhibits and the space surrounding the same, and be in complete order at least thirty minutes before the hour of opening. The removal of exhibits will not be permitted prior to the close of the Exposition.

All packages containing exhibits intended for the several departments must be addressed to the "Director-General, World's Columbian Exposition, Chicago, Ill." In addition, the following information must be written on the outside of each package:

(*a*) Department in which exhibit is to be installed.

(*b*) The State and Territory from which the package comes.

(*c*) The name and address of the exhibitor.

(*d*) The number of the permit for space.

(*e*) Total number of packages sent by the same exhibitor, with serial number on each package, list of contents of each package, and freight prepaid.

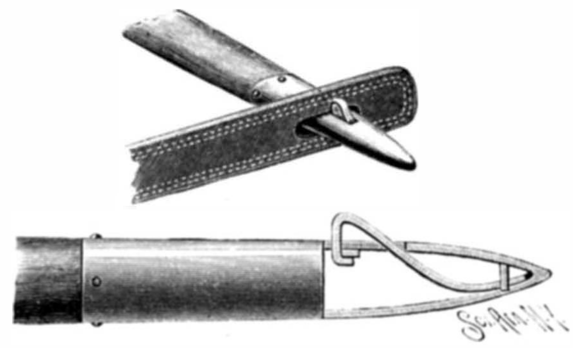
By addressing the Director-General, World's Columbian Exposition, Chicago, Ill., an application paper will be sent.

Steam Boilers in Out-of-the-way Places.

It may appear to be an extravagant statement, but it is believed that, in mechanical plants that use steam, the boiler room is, in nine cases out of ten, so located as to insure a waste each day of heat and steam large enough to constitute a respectable sum when figured out in dollars and cents. The men who plan such plants seem to have a mania for forcing steam to pass through long lines of pipe and to pass numerous bends. In these things they insure two wastes or losses: 1. Loss of heat and consequent condensation. 2. Loss by friction and by the bends, each of which subtracts from the initial pressure. Is it wise, asks the *Iron Industries*, to locate a boiler room so that these two wastages must go on just as long as the plant is in operation? Any one with average intelligence would think not. Yet this plan is everywhere seen, and in every case it implies a waste of money in first cost, a waste of more money in repairs necessarily made greater, a waste of money in steam made and not fully used, and a waste of money for the fuel and labor to make the steam.

A TRACE-HOLDING WHIFFLETREE ATTACHMENT.

A device designed to prevent a trace or tug from accidentally slipping off the whiffletree, yet permitting of its being readily passed to place and easily removed when required, is shown in the illustration, and has been patented by Mr. Gustave Carlson, of Sparks, Neb. A metal cap or tip is made to snugly fit each tapering end of the tree, and a tug or trace-holding lug or dog



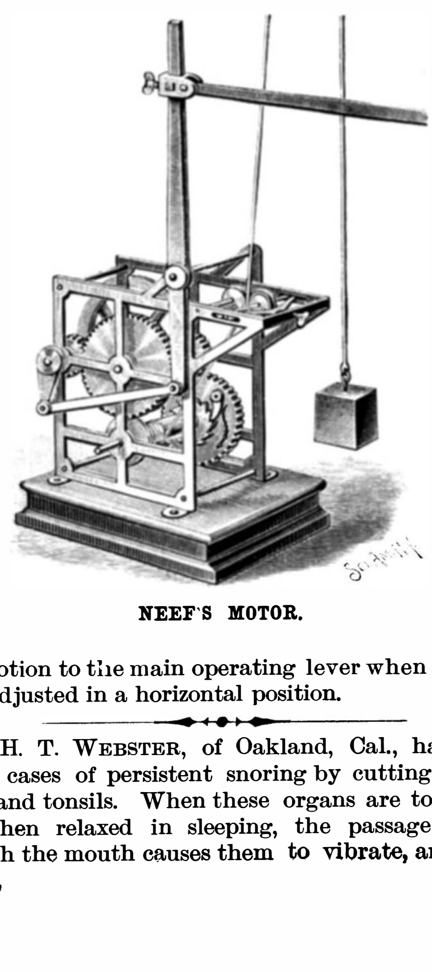
CARLSON'S WHIFFLETREE HOOK.

is fitted to work in a slot cut in the end of the tree, and through a corresponding slot in the cap or tip, as shown in the sectional view. The lug is formed of a spring bent to protrude through the slot, and when in its normal or raised condition its lower front end catches under a cross bar within the cap. The spring is sloped on its back, that the trace or tug may be readily slipped over it, th spring being then depressed, but being thrown outward at its free end when the tug has been passed to place. By pressing inward upon the spring the tug or trace may be readily slipped off the tree.

For further particulars relative to this improvement address the inventor or C. H. Corwell, Valentine, Neb.

A MOTOR TO DRIVE SMALL MACHINES.

A simple motor for driving sewing machines, churns, etc., has been patented by Mr. Charles J. Neef, of Texarkana, Ark., and is shown in the accompanying illustration. In a suitable frame is pivoted an upright lever on which is an adjustable sleeve in which is secured one end of a pitman or link onnected with the machine to be driven, the other end of the lever being connected by a link with a crank arm on a shaft carrying a fly wheel and a pinion in mesh with a large gear wheel on another shaft. On the latter shaft is a pinion in mesh with a loose gear wheel carrying a spring-pressed pawl engaging a ratchet wheel on the hoisting drum. The outer end of the drum shaft is square, for applying a wrench or crank arm, by which to wind up a rope on the drum. The rope extends upward between two rollers and over a pulley secured to the ceiling or other convenient place, a weight being attached to its outer end. One of the rollers between which the rope passes is held in stationary bearings, while the shaft of the other roller is mounted in slots, in which extend the ends of a brake beam adapted to bear against the ends of the shaft, the pressure of the brake beam on the shaft being regulated by a screw rod screwing in a cross beam of the frame. One of the rollers is grooved while the other has a rubber rim and is adapted to clamp the rope and hold it in a fixed position to stop the machine. The crank arm and link may be readily arranged, if desired, to communicate motion to the main operating lever when the latter is adjusted in a horizontal position.



NEEF'S MOTOR.

DR. H. T. WEBSTER, of Oakland, Cal., has cured several cases of persistent snoring by cutting off the uvula and tonsils. When these organs are too large, and when relaxed in sleeping, the passage of air through the mouth causes them to vibrate, and noise results.

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Correspondence.

The Recent Earthquake at San Diego.

To the Editor of the Scientific American:

I noticed in the last number of your paper a letter from a correspondent from San Diego regarding the recent earthquake in Southern California, from which your readers might infer that earthquakes are frequent and dangerous here.

I have lived here more than twenty years, and the last earthquake was the most severe that has occurred during that time. I was lying in bed, awake, at the time it happened, and I thought at first that it was a sudden and violent gust of wind that was rattling the window frames; but I soon realized that it was an earthquake. The rattling was exactly like, in duration and violence, the effect produced by a heavy and close clap of thunder, but, of cours , without the noise that the thunder makes. I was in a well-constructed, three-story house. No walls were cracked, nor any articles knocked from shelves. A gentleman and his wife, who slept in the room next to mine, were not awakened by the shock. I did not get out of bed, and was asleep in a few minutes after it was over. During the "boom" times here a few years ago a great many poorly constructed buildings were erected. The clay from which bricks are made in Southern California is generally of very poor quality. Fuel for burning them is very high (wood $7 per cord, coal $1. per ton), and, in consequence, bricks are very poorly burned. Buildings constructed from such bricks cannot stand much shaking. In some such structures the walls were cracked slightly in a very few instances; but there was not a single case of a crack in any well-constructed building where good, hard bricks had been used.

J. THOMSON.

San Diego, April 10, 1892.

Another Mathematical Prodigy.

To the Editor of the Scientific American:

Having read in your last issue an account of what may properly be called a mathematical prodigy, I think it may not be uninteresting to your readers to hear of another, which, in some respects, surpasses anything of the kind ever related.

Reuben Field is a native of La Fayette County, Missouri, a very strong, heavy set man, about forty-five years old. He never went to school, even a day, for the sole reason that he was always regarded an idiot. He can neither read nor write, and his reasoning powers have never developed beyond those of a child of the most ordinary intellect. In the face of these facts, however, he has the keenest perception of the relation of numbers and quantities, and is able, as if by instinct, to solve the most intricate mathematical problems. He does not know figures on a blackboard, but he understands them perfectly in his mind. No one has ever been able to "catch him" in multiplication or in division. He has been given problems as "The circumference of the earth is, in round numbers, 25,000 miles. How many flax seed, allowing twelve to the inch, will it require to reach around it?" Within a minute he returns the answer: 19,008,000,000. If the distance to the sun or to any of the planets is taken, he answers with as great ease. If given the day of the month and the year on which an event occurred, he instantly gives the day of the week. But what is yet more remarkable is that he can tell the time at any hour, day or night, without ever missing it even a minute. If awakened out of a deep sleep in the darkness of night, and asked the time, he gives it at once. Once in my office I asked him the time. He replied at once: "Sixteen minutes after three." In order to test him, I drew him off upon some other question, not letting him know my object, and when seventeen minutes had passed, I looked at my watch, and asked him the time. He said: "Twenty-seven minutes to four."

N. T. ALLISON.

Columbus, Kansas, April 16, 1892.

Climate of San Diego.

To the Editor of the Scientific American:

Thousands of people searching for a climate beneficial to consumptives have had a great deal of misinformation spread before them concerning Southern California. Laudatory and derogatory statements have been mixed together by writers whose views have been unduly colored by prejudices resulting from bad effects of the climate in certain cases, or by too free an entertainment by shrewd hotel keepers who want to make a writer feel good and write compliments for publication. It is difficult for an Eastern man to get absolute facts about Southern California. Allow me to state a few facts within my experience as a consumptive in San Diego since September, 1891. The winter was of exceptional severity, and therefore a good sample of what this climate is at its worst. We had rains, fogs, high winds; once or twice hail stones rattled against the window panes for a few moments. An earthquake cracked walls of buildings one night and thoroughly scared the strong and the weak. On the other hand we had fully two-thirds more mild, brilliantly sunny days than I found on the Atlantic slope during all of last summer.

There has been an equability at this sea coast town which delighted me, because, as an extremely delicate man, my system has been susceptible to slight changes of temperature. Only one week throughout the winter did the temperature fluctuate so decidedly as to cause remark. It then went below 32° F. in the lowlands. At an altitude of 150 feet the green tomato vines were untouched by frost. In the aggregate there have been, as nearly as I can recall, several weeks of cloudy, windy weather, when outdoor life was not advisable for a man in my weakened condition. The remainder of the time I have been able to stay outdoors eight or nine hours daily, sitting down the greater part of the day. Ocean fogs came in at night frequently, in the form of clouds, remaining about 1,200 feet above the town. In the morning they rolled seaward about eight or nine o'clock, to return at sundown. There was no fog low down. These fogs increase the humidity and add to the discomfort of some consumptives. But even so, the relative humidity here averages only 70 the year round, while the cool nights and warm days offer the exact conditions under which humans best thrive, according to such authorities as J. Henry Bennet, Briggs, and others. The fogs exist only a few months during the year. The rainy season does not deserve that name. It has not rained one day continuously since September. Light rains have fallen at intervals, amounting in all to about ten inches. The average fall for the year is eleven inches. The relative humidity records of New York or Boston show a lower relative humidity at those points than at San Diego. The absolute humidity of this point, however, is seldom approached in the East. The dryness of the air here is frequently but a fraction of a grain of moisture to the cubic foot. A reputable physician says meats and fish are cured in the open air here without putrefactive decay.

The difference between sunshine and shade here is more marked than in the East. New comers who sit in the sun and move into a shady corner may, in case they were too thoroughly warmed, catch cold. Invalids walking along the sun-bathed streets may suddenly meet an ocean breeze and become chilled instantly. Consequently prudent invalids always carry a light overcoat, and exercise more caution against chilling than is usual where the differences between sun and shade are less marked. Southern California has been roundly abused by people who have come here, and thinking the climate was almost tropical, have been careless, caught cold and suffered. Two friends of mine were stupid enough to put on light weight underwear on coming here. They caught cold at once. Delicate people must be very cautious all through California.

Climate is merely a helper to a consumptive. Good food and diversion are helpers of almost equal importance. They are found here. As a rule, no climate will permanently help a consumptive in the last stage of the disease. Such cases will find only temporary, if any, relief in the West. Incipient and secondary stage cases may find arrestment of their trouble in California. Thousands of people hereabout claim an arrest of consumption in their systems through life in this vicinity. My experience, as one in the last stage of phthisis, though a case where unusual vigor of the system has been aided by unimpaired digestion, convinces me, in spite of humidity, fogs, winds, and other disadvantages, that thus far the comfortable living accommodations, good food, and diversion offered right here on the sea coast overbalance the advantages of climate offered in New Mexico, Arizona, and elsewhere, coupled as those advantages are to the monotony, poor food, and some disadvantages climatically, which invariably attend life at these inland lung Meccas. And most important of all is the fact that here I can be outdoors more days in the year than any other place I know of in the world. Outdoor life and good food have added ten pounds of flesh to my bones and increased the cellular resistive power of my diseased lung; then, too, I have not been continually on the move in search of the ideal climate, and thus exhausting my vitality.

M. Y. B.

San Diego, Cal., April, 1892.

Ten Commandments to Switchmen and Brakemen.

First.—Don't take hold of a link to couple cars with a wet glove or mitten in frosty weather. If you do, it will stick to the link and your fingers will suffer.

Second.—Don't take hold of the head of a pin in a drawbar with your fingers back of the pin, or between the pin and the deadwood. If you do, and the pin is crooked or the draft iron is driven back far enough, your fingers may get nipped.

Third.—Don't go between cars to couple them where the load (logs, lumber, poles or railroad iron) projects over the end of the car. If you do, you may get crushed.

Fourth.—Don't attempt making a coupling between cars moving with force where the lug has been broken on the drawhead, without taking into your calculations that the drawhead is liable to be driven under the car. If you do, you are liable to have your hand taken off or get yourself crushed.

Fifth.—Don't swing and throw your whole weight on a brake wheel on top of a car, without knowing that the nut is on top of the brake rod. If you do, you and the brake wheel may take a tumble together, and the consequences will be more serious for you than for the brake wheel.

Sixth.—Don't step with the heel of your boot on a frog or on switch rails that are close together before or between moving cars. If you do, the frog or rails are liable to hold your foot as in a vise, and the moving wheels have no mercy.

Seventh.—In coupling freight cars where one car is higher than the other, always have the link in the highest draft iron; you will then not have to hold the link up, and the link will in a measure guide itself.

Eighth.—In coupling cars on a curve always stand on the outside of the curve; then, if anything gives way, or the load shifts on a flat car, you stand a better chance of escaping a squeeze.

Ninth.—If you think cars that are to be coupled up are coming together with too much force for safety, keep out and let them strike. It is much better for you to be called a "tenderfoot" than to lose some of your limbs.

Tenth.—In coupling a coach with a Miller coupler to a car with a common drawbar, always have the link in the Miller coupler, as the link is not near so likely to slip past the drawbar as it is past the Miller coupler. Make the same rule in coupling an engine to a Miller coupler; take the link out of the tender and put it into the Miller before backing.

Asphalt in India Rubber Compounds.

From the beginning of the rubber business manufacturers have appreciated the use of asphalt and tar in a variety of rubber compounds. Especially has this been true in goods cured in what is known as the dry heat. Boots and shoes, clothing and insulated wire compounds to-day all have a certain percentage of what is known as tar, but which is usually purified asphalt. The common belief that the goods are injured by the addition of this substance is wholly erroneous; a certain amount of asphalt compounded with rubber assists in calendering and during vulcanization imparts a certain toughness to the rubber which is not to be gained in any other way. The proportion used to-day is but small. For example, what would be known as a rich compound is 18 pounds coarse Para, 11 pounds litharge, 40 pounds whiting, 3 pounds asphalt, ½ pound lampblack, 11½ ounces sulphur. Exactly what asphalt is very few people seem to know, and it is almost invariably in the popular mind confused with coal tar. Asphalt as a paving material has been known since the Babylonian empire, and to-day paving blocks are found that preserve their integrity and have hardly begun to oxidize in spite of the atmospheric changes to which they have been exposed. It is only within late years that asphalt has been well known in the United States. It looks very much like pitch, and when ignited burns with a bright flame, giving off a dense black smoke. Alcohol, ether, oil of turpentine, naphtha, and many other reagents easily dissolve it. Its specific gravity is 2·23.

Until very recently all the real asphalt used in this country was imported. There is in the island of Trinidad a lake nearly two miles in circumference which is the source of the most of it, and it is said that near the shore the asphalt is very hard, but out in the center it is soft and viscid. When imported to the United States it comes mixed with sand and gravel and a variety of foreign materials, from which it is separated by heating over a slow fire for a week or more. During this heating process the impurities o a lighter nature rise to the top and are skimmed off, while the heavier substances settle to the bottom of the receptacle. There are very large deposits of asphalt in France and Switzerland, and within the last three years quite extensive deposits have been discovered in Utah and California, and small ones in Kentucky. For paving streets it is prepared by grinding first to a powder and mixed with crude petroleum and fine sand. It is then moulded into blocks of suitable size, or sometimes it is poured between blocks of paving stones, when it becomes hard, and greatly resembles the natural rock.

Another use for asphalt is in the manufacture of black varnish, where it is dissolved in oil of turpentine and linseed oil and makes an exceedingly durable coating. For insulating electric wires this sort of coating has been found of great use, and it is said that one of the best rubbers for wires to-day manufactured is made of a fine compound containing 30 per cent of India rubber, the compound after semi-vulcanization being dipped in boiling asphalt, which toughens it exceedingly. As asphalt is not affected by acids or gases, and is an absolutely waterproof compound, and as heat and cold do not affect it, it is a valuable article to use in connection with India rubber, although if too large quantities of it are put in it shortens the gum and may during the process of vulcanization cause it to blister. A great deal of the gum roofing sold in the United States which is thought to be India rubber or gutta percha is made simply from a solution of asphalt spread upon prepared paper.—*The India Rubber World.*

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THE GRANT MONUMENT.

The ceremonies attending the laying of the corner stone of the Grant monument, planned to take place on April 27, are not without interest to the people of the entire country, who feel a just pride in the fame of the great commander, but they are of especial significance to the residents of New York City and vicinity, who have become impatient of the long delay in providing a suitable memorial to take the place of the temporary tomb in Riverside Park. The design for the monument, shown in our first page illustration, has been approved by a committee of distinguished architects, the foundations are finished, a first course of granite, ten feet in height, has been put under construction, and the date selected for the laying of the cornerstone will be the seventieth anniversary of General Grant's birthday. This ceremony it is expected will be performed by the President of the United States, there being present upon the occasion citizens of distinction in all the walks of life, and the exercises being conducted with a state and solemnity designed to fitly mark a great historic event.

Although General Grant died in 1885, the movement for the erection of a suitable monument in his memory has met with so many obstacles that it is only within a few weeks past that the work of collecting the necessary funds has been pushed with a vigor to give promise of success. The committee first having the matter in charge were not united as to the amount which should be raised for the object, and it was a long time before a generally acceptable design was presented. Subscriptions amounting to about $155,000 were obtained, and then the work lagged, and for nearly seven years there has been almost nothing done. Recently, however, the Grant Monument Association, charged with the work of construction, has been reorganized and enlarged by legislative enactment, and a broad and carefully considered plan has been put in operation to interest every business, trade, and profession in the city in the obtaining of subscriptions for the prompt completion of the monument. Of this association, General Horace Porter is president, Frederick D. Tappen treasurer, and James C. Reed secretary, and, under the energetic direction of President Porter, committees of public-spirited citizens, representing all interests, are now actively engaged in the work, there being no salaried officials. The estimated additional amount required for the construction of the monument is about $350,000.

The design is the work of Mr. John H. Duncan, of New York City, who was also the designer of the Soldiers' and Sailors' Memorial Arch, now nearly completed, at the entrance of Prospect Park, Brooklyn. The lower portion of the structure is 100 feet square, its four sides facing the points of the compass, and the main entrance being on the south side. The monument is placed on a slight angle to the Riverside Drive, so that it will squarely face the point to the south on that approach where it first presents itself to the observer. It forms the terminus to the vista on 123d Street, looking toward the west. The height from the base line will be 160 feet, or nearly 300 feet from the water level of the Hudson River,

In front of the main entrance will be a colossal equestrian statue of General Grant, and over the entrance extends a portico, into which are worked the coats of arms of the different States. Further up is another cornice, into which are worked designs of weapons and battle flags. The pyramid at the top ascends by steps or terraces, and below it is a row of windows through which visitors may look from the inside, an outer gallery here being 130 feet above the ground line. The extreme top may be reached by steps above this gallery.

Within, the whole space is open, making a large hall, and in a crypt below the center of the floor the black granite sarcophagus will rest. This is according to a recent decision of the executive committee, for it was the original design to use this central hall as a memorial hall, in which also might be held assemblages of Grand Army men, the tomb itself then being a crypt at one side of the main hall. At one side is a staircase leading to a gallery 122 feet above the floor, from which fine views may be had over a wide region.

Over four of the six Doric columns forming the entrance will be equestrian statues of four generals who commanded under Grant, and the monument is to be surmounted by an appropriate statue or group. Panels on the east and west of the structure will receive bas-reliefs of others important in command in association with General Grant.

A more noble and beautiful site probably could not be selected in the whole country, as there certainly is not to be found a location where the monument would be more conspicuous than it will be at the north end of Riverside Park. The ground here is high above the river, laid out in beautiful and carefully kept lawns and walks, and the monument will tower above all structures in the vicinity, being visible from far up the Hudson and far down the bay.

TRINITY College, Dublin, was incorporated by royal charter in 1591.

Typhoid Fever.

The following memorandum on typhoid fever and its proper treatment was given to Major-General Ellis by the late Sir William Gull, M.D., two years after he was in attendance on the Prince of Wales during his illness in 1872. It was suggested to Major-General Ellis recently that the publication of this memorandum might prove useful, and it appeared in the *Times*. Sir William Gull's suggestions with regard to the treatment of typhoid fever have been observed in the case of Prince George.

I. Typhoid fever is a disease which runs a more or less definite course. It cannot be stopped or cured by medicines.

II. The chief thing to be done at the outset of an attack is to send the patient to bed, so as to save strength from the beginning.

III. No strong purgative medicines are desirable.

IV. As the fever develops, and the strength grows less, light food should be taken at short intervals—*i. e.*, water, toast water, barley water, milk and water, light broths (not made too strong, or too gelatinous).

V. If there be restlessness or much agitation of the nerves, wine (port, sherry, or claret) or brandy in moderate doses at short intervals. This must be directed medically, but in general it may be said that the amount required is that which induces repose and sleep.

VI. The bowels may be left to themselves. If unmoved for twenty-four or thirty-six hours, a lavement of warm water may be necessary, but this will be directed medically.

VII. The restlessness or wakefulness in fever is best remedied by the careful giving of wine or spirit with the food, or in water. Sedatives, such as opium, are inadmissible—mostly injurious.

VIII. The bed room to be kept at a temperature of 62 to 64 degrees.

IX. Great care necessary to keep the bed clean and sweet. This is most easily done by having a second bed in the room, to which patient can be removed for two or three hours daily, while the other is thoroughly aired and the linen changed.

X. All fatigue to be sedulously avoided. No visitors admitted, and no other person but one nurse and one attendant to help her.

XI. Patient's room never to be left unattended for a moment, as in the delirium of fever patient might jump from bed and injure himself.

XII. As to medicines and the treatment of complications, the immediate medical attendant must be responsible.

XIII. As it is probable that the discharges from the bowels in typhoid fever may be a source of contagion, it is desirable that before being thrown down the closet they should be largely mixed with Condy's fluid or some other disinfectant. On the same principle the strictest cleanliness must be observed in the sick-room.

XIV. There is no reason to believe that typhoid fever is contagious from person to person in the ordinary way. The largest experience shows that it does not extend, like an ordinary contagious disease, to nurses or others attending upon patients suffering under the disease.—*National Labor Tribune* [*England*].

The Market Price of Silver.

In the week ending April 2 the price of silver reached the lowest point ever recorded. On March 28 the London quotation was 39 pence per troy ounce, which was equivalent to 85·6 cents here, but the metal was offered by New York dealers at 85 cents per ounce, at which price the gold value of the silver in a silver dollar was worth 65·7 cents. Since then the price rose slightly, being quoted April 2 at 87⅛ cents. It is absurd to say that silver is suffering any "injustice" or "demonetization," or that any "crime" has been committed against it, to account for the decline in value to these figures. The value of silver, as of everything else, is governed by the law of supply and demand.

The production of silver has been going on for the past ten years at a constantly increasing rate, and while the consumption has increased, both for coinage and industrial purposes, and by the hoarding of the United States government (under the act of July 14, 1890), it has been far outstripped by production. In 1890 the United States produced about 54,500,000 ounces of silver; in 1891 the output was probably about 58,000,000 ounces. No statistics of the production of silver elsewhere in 1891 have been issued, but Mexico and Australia, the two most important countries after the United States, undoubtedly made an increase. In New South Wales, alone, the Broken Hills Proprietary Company turned out 9,599,932 ounces of silver in 1891, against 7,785,000 ounces in 1890.

The future course of the silver market may be predicted with as much certainty as that of any other metal, whether the United States government continues to buy 54,000,000 ounces per annum or not. The price will decline until the output is restricted, by the weaker mines closing down, and production more nearly approximates consumption. How much of a decline will be possible cannot be foretold, because there are no figures in existence of the *average* cost of producing an ounce of silver. Already many of the least favorably situated mines and some with low grade ores, like those of Butte, Mont., are closing down. But such a great producer as the Granite Mountain Mining Company, of Montana (which yielded 2,905,158 ounces of silver in 1891), produces it, according to the reports of its directors, at a cost of 51 cents per ounce, while it is well known that the rich mines of Aspen and the San Juan district of Colorado, and the Park City mines of Utah, produce silver for less than 50 cents per ounce. The famous Mollie Gibson mine of Aspen, Col., produced over 2,000,000 ounces of silver up to December 31, 1891, at a cost of 4·8 cents per ounce! The Broken Hills Proprietary Company, of New South Wales, produced 9,947,038 ounces of silver during the fiscal year ending November 30, 1891, at an expense of 52·6 cents per ounce (including depreciation of plant, etc.), and altogether omitting the lead product of 41,687 tons. We shall not be surprised to see the price of silver decline to 80 cents per ounce before the end of this year, and, should this country adopt free coinage, it would in time go below this, for that would remove the largest purchaser for the metal who would pay gold for it.—*Eng. and Min. Journal.*

New England in "Census Bulletin" 175.

The population of the New England States, as a whole, in 1890 is 4,700,745, which, compared with the population of these States in 1880, or 4,010,529, shows an increase during the decade of 690,216, or 17·21 per cent. The males in New England have increased 355,032, or 18·13 per cent since 1880, the whole number of males in 1890 being 2,313,755, as against 1,958,723 in 1880. There has been an increase of females in the New England States since 1880 of 335,184, or 16·34 per cent, the whole number of females in 1890 being 2,386,990, while in 1880 they numbered 2,051,806.

With the exception of Vermont, there has been a very material increase since 1880 in the number of foreign born in each of the States considered. The largest percentage of increase is found in New Hampshire, being 56·26 per cent. Very nearly the same percentage of increase was also reported for the decade from 1870 to 1880, or 56·34 per cent. In Massachusetts there has been an increase in foreign born since 1880 of 213,646, or 48·17 per cent, as against an increase from 1870 to 1880 of 90,172, or 25·52 per cent. In Rhode Island the increase in foreign born since 1880 is 32,312, or 43·67 per cent, as against an increase from 1870 to 1880 of 18,597, or 33·57 per cent. In Connecticut the increase in foreign born since 1880 numbers 53,516, or 41·17 per cent, while from 1870 to 1880 the increase was 16,353, or 14·39 per cent. In Maine there has been an increase in foreign born since 1880 of 34·10 per cent, and in Vermont of 7·64 per cent.

The whole number of foreign born persons in the New England States as a whole in 1890 was 1,142,339, while the whole number of foreign born persons in 1880 was 793,612. There has been an increase in foreign born during the decade of 348,727, or 43·94 per cent, as against an increase in native born of 341,489, or 10·62 per cent, the whole number of native born in 1890 being 3,558,406, as against 3,216,917 in 1880.

For the New England States as a whole, the males in 1890 numbered 2,313,755, or 49·22 per cent of the total population, and the females 2,386,990, or 50·78 per cent. There were in 1890 in New England, therefore, 73,235 more females than males.

The largest percentage of foreign born in 1890 is found in Rhode Island, or 30·77 per cent of the total population of that State.

The foreign born population of the New England States in 1890 represents 24·30 per cent, and the native born population 75·70 per cent of the total population.

Of the population of New England, 99 per cent are white and only 1 per cent colored.

In Massachusetts and Rhode Island hardly two-fifths of the population are of purely native stock, that is, native white of native parentage, the exact percentages being 42·67 for Massachusetts and 39·81 for Rhode Island, while not quite one-half or 47·87 per cent of the population of Connecticut are so constituted. Two-thirds of the population of Vermont and of New Hampshire, or 67·76 and 67·36 per cent, respectively, are of purely native origin, while for Maine fully three-fourths are of native stock, or 76·65 per cent. For New England as a whole, the native whites of native parents represent 51·82 per cent of the total population.

To Pump Out 800,000,000 Gallons.

According to the Boston *Journal of Commerce*, an undertaking of considerable magnitude and importance in mining operations is to be commenced in Ishpeming, Mich., as soon as the weather will permit. The Cleveland Iron Mining Co., the Lake Superior Iron Co. and the Pittsburg and Lake Angeline Co. have signed a contract with B. C. Howell, of New York, for pumping the water from Lake Angeline, under which each of the companies has a large bed of ore. The depth of the lake is 43 ft., and the estimated amount of water is 800,000,000 gallons. The contract calls for the completion of the work in five months.

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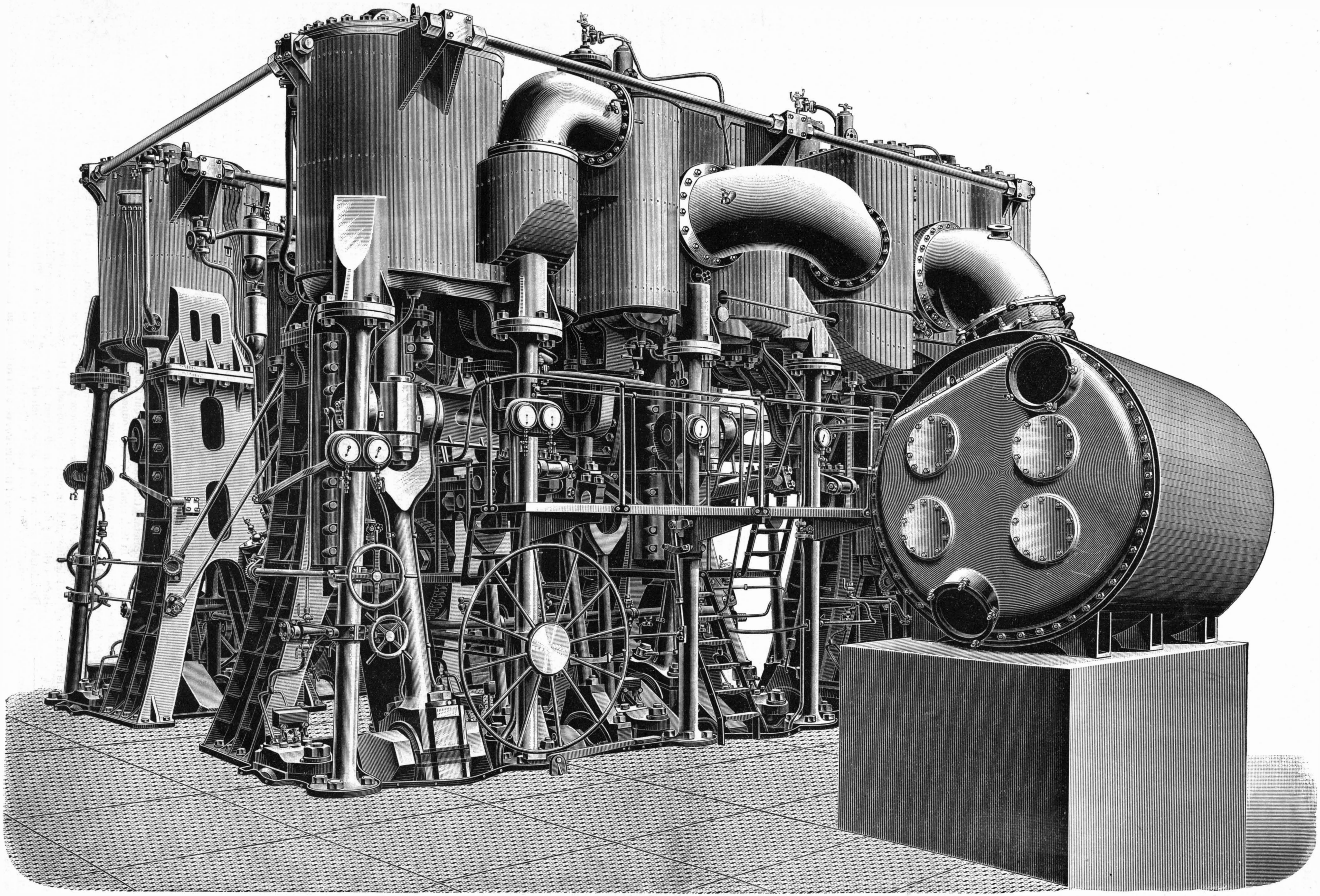

TWIN SCREW TRIPLE EXPANSION ENGINES OF H. M. FIRST-CLASS CRUISER EDGAR.—7,350 TONS—13,460 H. P.—SPEED, 21 KNOTS PER HOUR.—[See page 279.]

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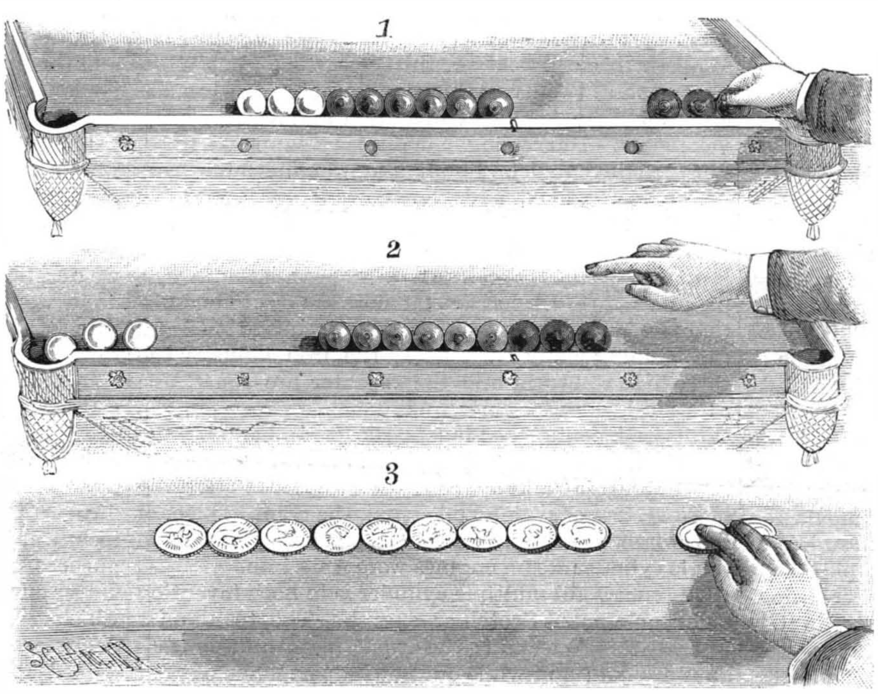
INTERESTING TRICKS.

The clever trick with billiard balls shown in Figs. 1 and 2 depends for its success on a truly scientific principle. A number of billiard balls are placed in a row against the cushion of the table. The player asks one of the spectators to name a certain number of balls to be pocketed without any apparent disturbance of the others. Suppose the number to be three. Then at the will of the player three balls separate from the others and roll into the pocket. The number is perfectly controllable, and when the hand of the player and one end of the row of balls is covered, the trick appears mysterious. It is hardly less so when the entire experiment is visible. The feat is accomplished by removing from one end of the series as many balls as are to be projected from the opposite end, and rolling them forward against the end of the row remaining. An equal number of balls fly off from the opposite end of the row and roll into the pocket. Three balls driven against one end of the series will cause three to roll off, two will drive off two, one will drive off one, and so on.

The principle of this trick is illustrated in the well known class-room experiment in which a series of contacting suspended balls of highly elastic material are made to transmit a blow delivered on the first of the series to the last ball of the series, so that the last ball will fly off without any apparent disturbance of the other balls. In this experiment, the first ball of the series is drawn back and allowed to fall against the first one of those remaining in contact. The impact of this ball will slightly flatten the ball with which it comes in contact, and each ball in turn transmits its momentum to the next, and so on through the entire series, the last of the series being thrown out as indicated.

In the case of the experiment with the billiard balls it is found by careful observation that separate blows are given to the series, corresponding in number to the number of balls removed, so that while the separation of the three balls at the end of the series is apparently simultaneous, in reality they are separated off one at a time.

In Fig. 3 is illustrated a method of repeating the experiment with coins in lieu of balls. Dollars or half dollars may be used, and the effect is produced by sliding the coins.



SCIENTIFIC TRICKS WITH BILLIARD BALLS AND COINS.

LOGGING IN MINNESOTA.

It is now no uncommon sight during the logging season of each winter in this State to see incredibly large loads of logs moved over a road through the forest by a four-horse team. During last winter the record for big loads of logs was broken by teams in the employ of the Ann River Logging Company, operating on the Ann River, a tributary of the Snake River. The scale of one of the loads, as given by the company's scaler, showed that it contained 63 logs, measuring 31,480 feet; weight of load, including sleds, 114 tons; height of load from the sleds, 21 feet; width of load, 20 feet. The load was hauled by four horses a distance of three miles, on one set of sleds and by one four-horse team. S. C. Sargent, an artist of Taylor's Falls, Minnesota, was present at the time these loads of logs were hauled, and photographed the loads as they came on the landing. We present herewith a cut from a photograph made by Mr. Sargent.

LOGGING IN MINNESOTA.

Range of War Ship Guns.

A 12 inch Schneider gun, under an angle of projection of 20° (average maximum angle used on board ship), will throw a 900 lb. shell 10½ miles. There are many guns now mounted on battle ships that have the power to throw projectiles ten miles, under maximum ship angles of projection. So says Lieut. E. M. Weaver, in the *Journal of the U. S. Artillery*. At Portland, Me., the ten mile circle passes out to sea some 3½ miles from nearest land, at Boston 2½ miles from land, at Brooklyn 2½ miles from land off Coney Island. Ships of war, at the above distances, could bombard the cities named with great shells and make frightful havoc. There is pressing need for the immediate provision of effective and abundant means for coast defense. It is to be hoped our law makers will make liberal enactments for this purpose.

THE BRITISH FIRST CLASS CRUISER EDGAR.

The Edgar is a powerful cruiser, being well protected by an armored deck, and by minute subdivision. The class of which she is the prototype comprises nine vessels, designed for the express purpose of protecting commerce on the high seas, and in such a case good offensive powers and high speed were essential. It was also necessary that the cruisers should be able to keep the seas for a long period or make fast voyages to distant parts without coaling, so that it was necessary to reduce all weights to enable the vessels to carry a large fuel supply, and the measure of success is the fact that on a displacement of only 7,350 tons they have bunker capacity for 850 tons, so that they could cross the Atlantic at full speed, and might steam 10,000 miles at a speed of 10 knots.

The engines are of the triple expansion type with three inverted cylinders and three cranks. There are separate sets for driving each of the twin screws, the engines being fitted in separate compartments. Of the two engines an engraving is here given, prepared from a photograph taken while the engines were in the erecting shop at Fairfield.

The high pressure cylinders are 40 inches in diameter, the intermediate pressure cylinders are 59 inches in diameter, and the low pressure cylinders are 88 inches in diameter, and each is adapted for a stroke of 4 feet 3 inches. The cylinders are all independent of each other, and are steam jacketed. The high pressure cylinders are each fitted with a liner of forged steel, and those of the medium pressure and low pressure are fitted with cast iron liners. All the cylinder covers are of cast steel. Each high pressure cylinder is fitted with a piston valve, and the medium and low pressure cylinders are each fitted with double ported slide valves, all of which are worked by the ordinary double eccentric and link motion valve gear. Balance cylinders are fitted to the intermediate and low pressure valve gear; these valves are also fitted with relieving rings at the back. The reversing engines are of the all-round type with worm and wheel gear, and the low pressure levers are fitted with a slot and adjusting screw to allow of the expansion in the cylinder being altered. The back columns are of cast steel fitted with separate guide faces pinned on, and the front columns are of forged steel. The engines are so arranged that the starting platforms are in the wings of the ship. As is shown on the plate, the main condensers are placed alongside the starting platforms and are of cast brass. The steam is condensed outside the tubes, the circulating water passing through the tubes. There are two large centrifugal circulating pumps of gun metal in each engine room. They are worked by independent engines made by Messrs. Tangye, Birmingham. The feed, bilge, and fire engines are all independent of, and separate from, the main engines, the steam being supplied by a special range of pipes. All the exhausts are led into an auxiliary condenser of cast brass, having a small air and circulating pump, one of these condensers being fitted in each engine room.

The crank, tunnel, and propeller shafting is of forged steel and hollow, supplied by Messrs. J. Brown & Co., Sheffield. The crank pins are fitted with centrifugal lubricating apparatus. The propellers are of gun metal, each propeller having three adjustable blades constructed to work outward.

Steam is supplied by four double-ended boilers 16 feet in diameter and 18 feet long, each with eight furnaces, and one single-ended auxiliary boiler, 12 feet 11 inches in diameter and 9 feet 3 inches long, having three furnaces. The furnaces are corrugated and are 3 feet 9 inches in diameter. The total number is 35, and the heating surface in all the boiler totals 20,108 square feet. The tubes are of naval brass. The working pressure is 155 pounds. The boilers are arranged in two water-tight compartments, the steam pipes being so arranged that the steam from the boilers in either boiler room can be used for the engines in either or both engine rooms. There are two funnels, one to each boiler room. As usual in vessels of the Royal Navy, the boiler rooms are so fitted that they can be closed and the boilers worked under forced draught when desired.

When the eight hours' official natural draught trial took place, the engines developed 10,178 indicated horse power with 99 revolutions. Before making the full power trial it was considered advisable to dock the ship and alter the pitch of the propeller. This having been done, the four hours' full-power forced draught took place, the result being 12,463 indicated horse power with 104·5 revolutions. The average speed of the vessel during the four hours was nearly 21 knots per hour, thus making the Edgar the fastest vessel in the British Navy. To ascertain the efficiency of the ship and machinery, the vessel was taken to Stokes Bay measured mile, and a series of progressive trials extending over two days were carried out, the trials being conducted by Mr. W. H. White, C.B., assistant controller and director of naval construction, and Mr. A. J. Durston, engineer-in-chief, assisted by other officials from the Admiralty, the Fairfield Company being represented by Mr. Andrew Laing. On the full-speed mile trial the engines developed 13,101 indicated horse power average, or 13,460 indicated horse power maximum.

During the whole of the trials the engines and

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boilers worked most satisfactorily, without the slightest hitch, and with an entire absence of vibration when at the highest speeds. The boilers maintained an ample supply of dry steam under an air pressure of about seven-tenths for full power, and on examination at the conclusion of the trials they were found to be in good order and perfectly tight. These boilers are the largest yet constructed for the British Navy; they are double-ended, and have a common combustion chamber to each two furnaces, and not the slightest trouble was experienced in the working. Altogether the trials of the Edgar have been most successful, and the results obtained reflect great credit on the designer of the ship, Mr. White, of the Admiralty, and on the machinery designer, Mr. Andrew Laing, of the Fairfield Works. The engines were built at the works at Govan of the Fairfield Company, while the ship was constructed in the dockyard at Devonport.—*Engineering.*

American Boasting.

BY PROF. JOHN E. SWEET.

None of us think as well of the man of real merit who appears over-conscious of it as we do of him who is less persistent in forcing the fact of his merit upon others. Is not this equally true of communities, States, districts, and industries in this country? Will it not be helpful to pause a moment in the self-glorification to which success has made us prone, and consider a little more humbly just where we stand?

While this is the greatest century of all centuries in the advancement of what we suppose to be general civilization, and of what is certainly industrial progressive civilization, and while this nation is moving on side by side with other nations, does any know less of what others do than we, and are any so stupid about profiting by what others are doing? Or if other nations are as thoroughly convinced of their merits, do they not keep their conviction more to themselves?

That we excel other people in certain lines of industry is a fact, but that they excel us in others leaves us the less to boast of. Great as are our achievements, with our facilities and the added knowledge of centuries, what have we in greatness to compare with the great works in ancient Egypt, with the art and architecture of Greece, with the paintings, sculpture, buildings, roads, aqueducts, and baths of ancient Rome? Where do we compete with the tombs and silks of India, with the palaces of Venice, with the education of Germany, the pottery, tapestry, art, industry, science, engineering, taste, and beauty of France? Are we really in the race with the carvings of Switzerland and Norway, the sculpture and music of Italy, the lacquer work and jades of Japan, the silks and ceramics of China, and with the world of achievements and supremacy in invention, mechanics, engineering, science, medicine, metallurgy, navigation, manufactories, implements and instruments of war, postal service, civil service, internal improvement, and the local government of England?

Other nations give us credit for those things in which we surpass them. Why are we so reluctant and ungenerous, if not unfair, as not to return the compliment? Is it because we are too conceited, or is it because we do not know, perhaps? But it is not to our credit if it is so. Is it because we blow our own horn and expect them to do the same? If so, that at least is not a trait to be proud of. Or is it just this, that to do so would not be American?

We boast of our great men, of our inventors, of our mechanics, of our workmanship, of our achievements, but how much allowance is made for what was done before by other men, other nations, and for the work done before we began? We may well be proud of our Franklin, but how many great men were there before? He demonstrated that lightning and electricity were one, but how much was known about electricity before?

Most of those who read the history as given in the "Royal Encyclopedia" will be astonished. We are proud of Morse, and well we may be; but his great achievement was not in the invention of the electric telegraph, for that was done by others at the time or earlier; but he invented the best one, and with the aid of such men as Ezra Cornell erected and put in operation a telegraphic line. The electrical part had all been preceded by Faraday and other European electricians. The mechanical part was crude compared to the present perfect instruments. Among our present electricians there is a small army of them, each a tooth or a wheel in the great machine, but there are many and many a tooth and wheel in the great machine besides. The genius of one man seems great to us to-day, but it is but another step added to the genius of another man who added his step to that of the others who preceded him. Corliss was a great man, but he came after Watt, a greater one. Our machine tool builders are great men, but they follow Whitworth, Maudsley, Roberts, and Nasmyth. We excel in woodworking machinery—not in every respect; and nine-tenths of every woodworking machine tool is but the carrying out of Bentham's patents granted in England a century ago. Watt invented and constructed the copying lathe before Blanchard. Newbery, of England, invented, and Perin, of Paris, perfected and introduced the band saw machine.

We manufacture clocks, cheap clocks, good clocks, and Yankee clocks, but few of the best, and the science of timekeeping and clockmaking is old. We manufacture watches as pieces of small machinery better than others, yes; but as timekeepers, no. The highest priced and best watches are still made in England and Switzerland.

We make fine machine tools—more ingenious than others, yes; better than others, no. We make standards of measure of straight and flat surfaces, standard gauges, after Whitworth's models, and a good while after Whitworth produced and introduced the same things. Darling's scales were ahead and better than all others. Pratt & Whitney's gauges are better than Whitworth's of twenty or thirty years ago, but Whitworth's *were* twenty or thirty years ago. Sewing machines were an American invention and American development. Harvesting machines are supposed to be, but Bell invented and built a mowing machine years before McCormick, and the mowing machine is an American development, not an American invention.

The typewriter in its perfected form is American, the lawn mower and bicycle are not. Some things in textile manufacture are American, far more are not. The knitting machine may be American, the Jacquard loom and the spinning jenny are not. In the iron industry the three high roll train and the repeater are American; cast steel, the Bessemer and Siemens processes, the Whitworth compressed ingots, the steam hammer, the hot blast, and the Whitwell stove are not. The sleeping car and air brake are American; the locomotive, the block system of switch and signal, the point in place of the switch, are English. The greatest improvements in single cylinder steam engines were American.

The successful multiple cylinder is in both invention and development Scotch or English. The turret on a war vessel is American; the armor plate and built-up guns are not; and while our newspapers make out our vessels and guns to be superior to others, the gun trials seem to be made on a half charge of powder, and the claim based on the assumed full charge, and the armor-clad vessels that we are *going to build* are the ones that are superior.

According to our papers the Pennsylvania depot at Jersey City is the largest single room in the world. That would be true if it were not for the Machinery Palace in Paris, which is more than twice the size. We have the largest bridge in the world, or would have, if it were not for the Forth Bridge in Scotland. Our Washington Monument is taller than the Pyramids, taller than St. Peter's, each of which is something besides what some one has called a "marble railroad spike," and the Washington Monument would be the tallest structure in the world were it not for the Eiffel Tower, which is not quite twice the height. We have the largest statue in the world, but it was made in France. We perform wonders both in large things and small, but there are few things, indeed, after all, either large or small, that are not better done in other countries; so few, indeed, that it seems hardly worth while to boast of them, even if boasting were not a detriment to us in the eyes of other people—a detriment to ourselves because such a thing is detrimental to progress, and a thing that is in shocking bad taste at the best.

Among the things most boasted about, and upon which we have the most reason to pride ourselves, are our mechanical inventions and the products of our mechanical engineering establishments.

In noting the things in which we surpass the world it will be well to balance them against the following on the other side:

Lumber is much better sawn and with much less waste in nearly all other countries than here. Joiner work was first much better done in Austria. Iron casting is a fine art in nearly all countries, except England, compared to our productions. Steel in all its forms is as good or better. Steel casting to shape, Muntz metal and Mitis metal are of foreign origin. Solid drawn steel tubes, laminated gun barrels, and Stubs wire are imported. The most economical and best built horizontal engines are built in Switzerland. A better built Corliss engine than was ever seen in this country was exhibited at the Paris Exhibition, built at Creusot—an engine with work about it that no American could even tell how it was done. There were also exhibited engines better finished than the highly-finished Brown and Straight Line engines, with even a greater difference between the American and the Mulhouse in workmanship than between the others. Machine tools with better material, better designed, and better workmanship than the best of the American.

A few points among the many: Successful hardened and ground steel journals and boxes; cast steel hardened and tempered gears and pinions; turret heads on screw machines with hardened and ground tool steel turrets; and here the writer, by way of parenthesis, would beg to suggest that perhaps the number of American steel makers, machinists, and smiths that court the job of making a piece of tool steel 6 inches thick 10 inches diameter, boring seven or more holes through it, and hardening the thing as hard as fire and water will make it, are rather limited, with many another job which we possibly could do, but don't. Of the machine tools we have originated, how many of them but are the natural outgrowth of the original slide lathe, planing machine, gear cutting machine, drilling machine, shaper, trip hammer, steam hammer, rolls, punching machine, shearing machine, bending rolls, and later forging machine, hydraulic press, hydraulic riveter, cold iron saws, and band saws for iron—none of which originated with us—which shows that the outgrowth from the early machines has not been wholly confined to this country, and that all the bold departures do not stand to our credit.

We have done nothing further in advance of precedent than rolling tubes from the solid bar.

In the foregoing I have intended to be strictly fair, and though I may be here and there in error, there are no doubt scores of things better done abroad than here, or not done at all here, that I have not mentioned.

Things are done in India, China, and Japan in the way of working metal, and that, too, by the crudest of tools, which we, with all our ingenuity and appliances, could not accomplish. It will be said in reply that "we don't want to;" true, but on the other hand, when we question why everything abroad is not done as we do it, would it not be well to think perhaps they, too, "don't want to," instead of ridiculing their way, and thus setting it down to inability or ignorance?

In fine, are we legitimately boastful, or are we not?

It is the practice among foreign periodicals to publish everything they find of ours that seems to them superior, and they do it both that their people may profit by the information and as a stimulus to keep their industries up to the times. It is the practice with our technical journals to copy these notices; but for what purpose or why it is hard to tell. What it does is to flatter our vanity and cultivate our conceit, neither of which seems necessary.

There will be among my readers hundreds who have gained their knowledge from reading, who will set down the above as the chattering of a crank, as a libel on our national greatness, as the prattle of a man void of patriotism; and, too, there may be scores of others equally as competent to form an opinion as myself, who can find abundance of evidence satisfactory to themselves that shows the above claims are wrong, and to those I would reply in advance as follows: Admitting it to be so, is not cultivating the notion that we can learn nothing from other nations detrimental to progress? Is not boasting in every form bad taste? —*American Machinist.*

Large Electric Mining Plant.

One of the largest electric mining plants yet installed in the United States has been put in the Virginia group of mines near Ouray, Colo. The water power plant is located nearly four miles from the mines, and consists of a small duct from which an iron pipe is extended a distance of about 4,000 ft. along the side of the canyon, producing an effective head of 485 ft. Two Pelton water wheels, one 5 ft. and the other 6 ft. in diameter, are used, capable of developing 500 horse power and 720 horse power, respectively, or a total of 1,220 horse power. The wheels are connected independently, so that the entire station may be run with either one. The electric generating plant consists of one 100 kilo-watts and two 60 kilo-watts Edison dynamos, giving a total output of 295 electrical horse power. The machinery which is operated by this current at the mines consists of one pump of 60 horse power capacity and another of 25 horse power, one 25 horse power hoisting machine, two 60 horse power Edison motors running stamp and concentrators, and one 15 horse power blower. The hoisting engine is an Edison motor of standard type, the winding and controlling switch being the same as used on street cars. This motor is geared to the drum through a friction clutch. Coal at the mines, it is stated, costs $18 per ton, and before this plant was put in the power cost the mining company nearly $40,000 per annum, and they are expecting by the use of this system to practically do away with this expense.

The Cape Hatteras Light.

The projected lighthouse on Outer Diamond Shoal, about eight miles off the mainland at Cape Hatteras, which was undertaken by Messrs. Anderson & Barr more than two years ago, has been abandoned, and the contractors, after having expended nearly $100,000 upon the undertaking, have canceled all orders for further work. The lighthouse was to have been erected for $485,000, the light to be ready January 1, 1892, and to remain continuously lighted a year before any payment should be made. In the effort to fulfill the contract a caisson of iron and steel was built weighing 1,200 tons, and towed from Norfolk to the shoals, but in attempting to sink it in place the structure was totally wrecked and the men at work narrowly escaped drowning. The present light is in a tower 165 feet high upon the mainland, but in running in toward the shore to get bearings from the light, vessels are frequently caught in the currents and breaking seas of the shoals stretching far out to sea.

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Tinplate Definitions.

From *Tin and Tinplate*, by Joseph D. Weeks. Tinplate, or to speak more accurately tinned plate or tinned sheets, is thin sheets or plates of iron or steel coated with tin.

Terne plate is sheet or plate iron or steel, covered with an alloy of tin and lead, usually two-thirds lead and one-third tin. It is this union of three metals, iron, lead and tin, that gives rise to the name terne plate, terne being the French equivalent of the English adjective tern, meaning threefold. The oft-repeated statement that terne is from a French word meaning dull is incorrect. Terne plate, because of the presence of lead in the coating, is duller than tinplate, which is frequently called bright plate, but it is not this fact that gave rise to the appellation terne, but the union of the three metals.

Taggers tin is a thin tinplate, 30 wire gauge and lighter. This name is not applied, as is often stated, because the iron out of which the plate is made was at one time and is even now used for tags or marks. The term was originally used to designate the very thin sheet iron which ran below the gauge—"tagged on" to the regular gauge—and hence these thin sheets tinned are called "taggers tin."

There is a question as to whether the tin used forms an alloy with the iron or is only a simple coating. It seems to be more firmly attached to the iron than a mere coating would be, rarely, if ever, when the sheet is properly prepared, scaling off, but requiring absolute rubbing away to remove it. It is probable that the tin coating forms an alloy with the iron.

The plates thus coated form the well known tin and terne plates of commerce, the sheets varying greatly in size, from 10 in. by 14 in. to 40 in. by 84 in.; in gauge of plate from 22 to 30 for tin and terne plate and 30 to 38 for taggers; put up in boxes containing 14 to 225 sheets, and varying from 7¼ pounds to 400 pounds a box. The standard size of tinplate is I C coke plate 10 in. by 14 in., with 225 sheets to a box, and weigh nominally 108 pounds to a box.

Tinplate is thin sheets of iron or steel, 22 w. g. to 30 w. g., coated with tin. It is called also bright tin, tinned sheets, tinned plate. The French name is *fer blanc*, or white iron, a name that was at one time used in England.

Taggers tin is very thin tinplate 30 w. g. and lighter.

Terne plate is sheets of iron or steel coated with tin and lead. The proportions of these two metals and the consequent quality of the terne plate vary greatly; the more lead, the inferior the plate. Roofing plates, from their almost exclusive use for this purpose; Canada plates, from their extensive use for roofing in that country, are other names for ternes.

Charcoal plates are tinplates, the iron plates of which were made of charcoal iron. But few charcoal plates are now made.

Coke plates are tin or terne plates made from puddled iron plates.

Bessemer plates, Siemens plates, open hearth plates, indicate the kind of steel out of which the plates are made.

A mender or return is an imperfect plate returned to the tin house to be mended or repaired.

Wasters are imperfect plates, sold as such.

Black plate is the iron or steel plates or sheets as they come from the rolling mill, having been cut to the proper size. They are termed black pickled plates after the first pickling or immersion in dilute acid. Cold rolled plates after cold rolling. White pickled plates after the second pickling, and when they are ready for the tin pot.

Large Glass Cells.

Hitherto glass cells have been blown, and owing to this their size has been very limited, the largest being only about 22 inches long by about 12 inches or 14 inches deep, and the same in width. By the process now successfully carried out by Armstrong's Glass Company, of Birmingham, tanks and cells of any dimensions can be constructed. The process consists in welding or fusing plates or sheets of glass together, thus forming a solid glass tank, with all the advantages of having the sides straight, the bottoms level, and the angles all square and to accurate measurements, the blown boxes being frequently quite the reverse in these respects. Armstrong's Company show at the Crystal Palace one tank 4 feet 6 inches long, made by their new process, which is briefly as follows:

A mould of iron of the interior dimensions of the tank is placed into a furnace, and upon this mould are fastened the plates of glass. The furnace is gradually heated until red hot. Then an oxyhydrogen blowpipe or an electric arc burner is introduced to heat the edges. A small roller which is attached to the blowpipe is next brought over the junction, and the joint formed. When all the joints have been finished the cell is left to anneal, and when perfectly cold the glass box or tank, thus formed out of five glass plates welded together, is lifted off the iron mould, being a perfect tank, solid throughout, and capable of resisting acids and alkalies. The same company show an underground conduit for electric cables, formed of slabs of glass, grooved with longitudinal parallel grooves. In laying these, after the trench in the ground has been formed, a cement concrete trough is made; inside this trough a layer of pitch or asphalt is run in. Upon this soft pitch the bottom sections of the glass slabs are placed. Upon these the upper sections of the glass slabs are placed, the joints being broken by each section. The whole is then run in with pitch or asphalt, and covered up with the concrete.

NOVEL TOYS.

On any pleasant day may be found on lower Broadway and other down-town thoroughfares venders who sell almost anything in the way of novelties. Among these may be seen culinary implements, toilet articles, cheap microscopes, magnifying glasses, and various toys. Nothing takes better in the way of articles for this kind of trade than some new toy. Whether a toy

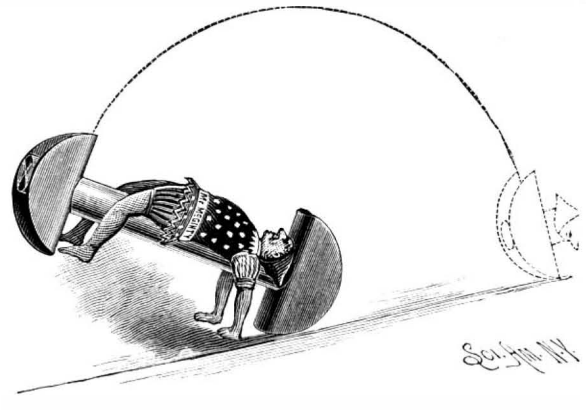

Fig. 1.—ACROBAT WITH MERCURY WEIGHT.

will probably have a good run can be determined by these venders in a very short time. If it takes well, crowds gather around him, and he drives a thriving business, making money for himself as well as for the inventor. If, however, the article is not wanted, the vender very soon finds it out, and looks for other wares.

Some of the toys are scientific, others are not. We give two examples of scientific toys which have sold very well. They are similar in character, and illustrate what shifting the center of gravity can do. They are both acrobats. The one shown in Fig. 1, and designated "McGinty," consists of a paper figure attached to a tube closed at both ends and inserted in paper disks which are bent down on the tube, forming semicircular end pieces on which the device may roll. A drop of mercury placed in the tube completes the toy. When placed on a slightly inclined surface, with the tube parallel with the surface, the mercury rolls to the lower end of the tube, causing that end to preponderate. The lighter end, by its own momentum, moves forward until it strikes the inclined surface, when the mercury again rolls to the lower end and causes another half revolution, and so on. This toy moves down the incline with a slow and stately movement.

The toy shown in Fig. 2 is made upon the principle just described, but the round ends of the figure

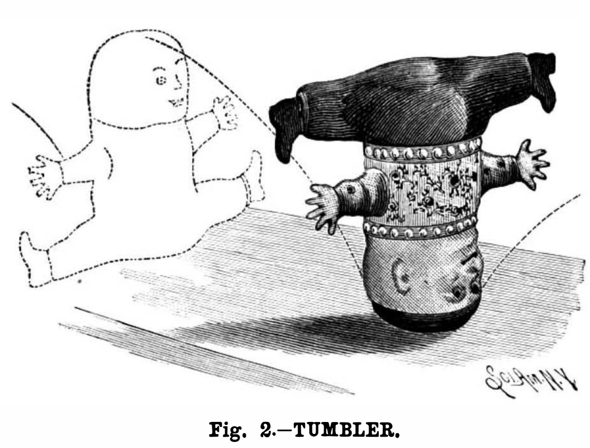

Fig. 2.—TUMBLER.

furnish the rolling surfaces, and a bullet is used for the weight instead of a globule of mercury, the body being simply a straight paper tube with convex ends.

Yearly Tides.

At a recent meeting of the Engineers' Club of Philadelphia, Mr. W. S. Auchincloss read a paper on yearly tides. The author stated that he proposed to show that confined bodies of fresh water are subject to yearly tides of greater or less magnitude, depending upon the nature of the basin or upon the strata to which they are confined, and upon the effect of evaporation if in an open basin.

In March, 1885, we had occasion to sink a well near Bryn Mawr, Pa. Natural anxiety as to the permanence of the supply led us to observe the depth of the water at intervals of about ten days. It soon became evident that the water was receding. In 1886 there was a gratifying rise of the surface and a total gain of 12 feet. Our curiosity was aroused and we determined to study the law, if such a law existed, of this ebb and flow. These observations have been continued during the past seven years. We found that in normal years the surface of the water reaches its lowest level in December, rises until June, and descends during the autumn.

An examination of the amount of the rainfall shows that while the amount of rainfall was as great or greater during the last half of the year as during the first, the level of the water in the well continually lowered. Atmospheric temperature had practically no effect, as the temperature of the water in the well is practically constant all the year round. The depth of the well prevented evaporation from its surface from having any effect.

The author believes that the true cause is the result of the influences of gravity and of the sun's attraction at different seasons of the year. When the sun reaches its furthest point south of the equator, gravity exerts its maximum influence on the waters of the northern hemisphere. The waters of the earth will be drawn into the minutest crevices and the surfaces lowered, but in June they will, in a measure, be released and, under the influence of adhesion and friction, will be held at a higher level than during any other season of the year.

Data obtained from the government records, showing the depth of water in the great lakes, show that there is a similar rise and fall, the range of yearly ebb and flow being from 12 to 15 inches in our northern lakes. So far as we are aware, no data exist for the small lakes. More extended research will, we believe, secure as complete a recognition of yearly tides as physical geography has always accorded to the phenomenon of daily tides.

The author presented two diagrams, one of which showed the rise and fall of the water in the well covering a period of seven years, and also the northing and southing of the sun for the same period.

The Poor Children of New York.

Mr. Riis, in an article on the poor children of New York, in the May *Scribner's*, says that "in ten years, during which New York added to her population one-fourth, the homelessness of our streets—taking the returns of the Children's Aid Society's lodging houses as the gauge—instead of increasing proportionately, has decreased nearly one-fifth; and of the Topsy element, it may be set down as a fact there is an end."

"Half the poverty, the ignorance and the helplessness of the cities of the Old World is dumped at our door by immigration," while the procession of the strong and the able move on to the West.

The police census returns show that in 1890 there were in all the tenements of New York City, 160,708 children under five years of age. This does not imply that there were so many really poor children, by a good many thousand. The census taken more than a year ago, for a special purpose, of the Jews in the East Side Sweaters' District, showed a total of 23,405 children under six years and 21,285 between six and fourteen, in a population of something more than 111,000. All of these were foreigners, most of them Russian, Polish and Roumanian Jews.

According to the tenement house census in New York, in the entire mass of nearly a million and a quarter of tenants, only 249 children under fourteen years of age were found at work in living rooms by the sanitary police. This is one of the encouraging facts mentioned by Mr. Riis in his article.

Of the 60,000 Hebrew children in New York, fully one-third go to school. "The poorest Hebrew knows that knowledge is power, and power, as the means of getting on in the world that has spurned him so long, is what he yearns for. He lets no opportunity slip to obtain it. Day and night schools are crowded by his children, who learn rapidly and with ease.

"There are 5,000 children in the twenty-one industrial schools scattered through the poor tenement districts of New York City. A count made last October showed that considerably more than one-third were born in twelve foreign countries where English was not spoken, and that 10,000 knew no word of our language."

Without doubt, the longest step which has yet been taken in the race with poverty in New York City is the establishing of many kindergartens for the poor children, to which access is made easier every day. There they get their earliest notion of order and harmless play.

The lack of small parks and playgrounds in the tenement house district of New York, and the consequent perpetual tussles between the children, at harmless play in the street, and the police, are the chief forces in the development of the "tough." The germ of the gangs, he says, that terrorize whole sections of the city at intervals, and feed our courts and jails, may, without much difficulty, be discovered in these early and rather grotesque struggles of the boys with the police.

Drunkenness is the vice that wrecks about half of the homes of the poor which do not cause it. It is that which, in nine cases out of ten, drives the boy to the street and the girl to a life of shame.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING.—William D. Williams, Ogden, Utah Ter. In this coupling the drawhead has formed at its outer end three prongs, an upper, a lower, and an intermediate prong, the latter extending in an opposite direction from the other two, while in the drawhead is journaled a shaft to which is attached a link against which a locking device has a bearing. The coupling couples automatically, and when coupled with another of its kind the two drawheads are designed to ride together in a proper manner, not separating under exceedingly heavy lateral strain, while the drawhead may also be used to couple with the ordinary link and pin coupling when necessary.

RAILROAD TIE. — Edward S. Moffat and Theodore G. Wolf, Scranton, Pa. This tie is designed to be made of a section of ordinary track rail, having near its ends blocks fitting nicely around the rail, to which the blocks are bolted, the blocks having flat tops to which clips are bolted, the track rails being held in place by the clips. A plain flat bar may be substituted for the tie bar formed of a rail section, the tie bar being embedded in the usual way when the ties are laid, while the blocks project slightly above the surface to support the track rails at the right height.

CAR UNDER-TRUSSING. — Ferdinand E. Canda, New York City. This invention is designed to secure a depth of truss that will properly support the center of the car with a minimum of material, and at the same time secure the greatest carrying capacity, the improvement consisting in forming or upsetting a collar on the truss rod, integral with it, at a point adjoining the position occupied by the queen post. An anchorage is thus formed for the queen post, to hold it in place and prevent creeping, permitting an even tension on the truss rod.

Mechanical Appliances.

PHOSPHATE WASHING MACHINE. — George W. Roberts, Chisholm's Island, S. C. This machine has a revoluble washing cylinder, an elevator being arranged to deliver into the cylinder and a conveyor to supply the elevator, a motor driving the cylinder, the elevator, and the conveyer, and the whole apparatus being mounted upon a portable structure so that it may be conveniently moved from place to place. The machine is adapted to receive the crude rock or ore from adjacent cars and deliver the washed material into other cars, obviating the necessity of carrying away waste material, and it is also applicable to the washing of various kinds of ore.

LATHE.—Isaac C. Swisher, Coffeyville, Kansas. This is an automatic metal boring and mortising, shaping, turning and screw-cutting lathe, adapted as well for milling, planing and rifling. The bed has the usual parallel shears or ways, on which the tail stock, work holder and tool carriage are mounted, the tail stock being adjustable, and having means for clamping it in any position, while the tool carriage and work holder are reciprocated automatically by the feed screw. The invention covers various improvements connected with the tail stock, work holder, tool carriage, head stock and clutch gearing, enabling the machinist to operate on objects of greatly differing shapes and to do more accurate and varied work than is usual in this class of lathes.

WHIRL FOR FILLER FRAMES.—Herbert Allcroft, Paterson, N. J. This invention provides a simple form of whirl designed to afford an even bearing for the spindle and support it in such a manner that it cannot possibly stick. The lower end of the spindle is flattened where it extends downward into the whirl, in bearings within which are journaled anti-friction rollers, the end of the spindle passing between these rollers. The spindle is thus held firmly to revolve with the whirl, neither the spindle nor the rollers being worn, while the spindle runs easily, so that as the silk or yarn is wound upon the quill, the winding will be very evenly and nicely done.

ORE ROASTING FURNACE. — George F. Bartlett and Augustus J. O'Neill, Butte City, Montana. This furnace is designed to be self-actuating and is arranged to permit of conveniently regulating the draught to insure complete combustion. Inclined endless carriers are geared together one above the other within the furnace, a funnel discharging upon the upper end of the upper carrier to impart motion thereto, while blast pipes crossing the spaces above the carriers are provided with depending apertured branches, having stirring points at their lower ends toward the upper ends of the carriers, a worm geared to the shaft of the lower carrier being operated thereby to regulate the speed of the carriers.

CYLINDER DRAIN COCK. — Roy P. Capwell, Linden, N. Y. This improved cock is designed for automatically draining the water of condensation from the ends of the steam engine cylinder without waste of steam and consequent loss of power. The valve body is connected with the ends of the cylinder and contains two valve seats adapted to be alternately engaged by two valves held on stems projecting from a lever between the valve seats. The engineer has ready control of the drain cock, being able to set it out of operation or put in into operation whenever desired.

SAWMILL CARRIAGE CANTING BLOCK. —Patrick C. Roche and Charles Colclough, Gertrude, Ga. A shaft is journaled on the carriage, and there is a link connection between it and blocks carrying canting dogs sliding in movable guides, the dogs being raised and lowered when the shaft is rocked. The device is capable of convenient attachment to any carriage, and may be expeditiously manipulated to throw the finished lumber from the carriage, while it is so constructed that the blocks may be fed to and from the saw with the head blocks, and the canting blocks are so located with respect to the head blocks that the head block setter can manipulate the canting blocks without interfering with the regular duties of the setter.

LUBRICATOR. — John Sandall, New York City. This is an improvement in the feed for oil cups and equivalent lubricators, being a siphon feed capable of use without a wick to convey the most viscous oil from the lubricating device to a bearing in an efficient manner. The siphon feed has a valve whereby the quantity of oil to be fed may be controlled, and the construction is such that the siphon may be removed from the lubricating device and laid to one side without danger of the oil oozing out or spilling, thus destroying the vacuum, the feed tube being always filled and ready to be placed back again when removed from the cup for purposes of cleaning or repair.

SHINGLING GAUGE.—Chancy Avery, Pleasant Lake, Ind. This is a simple and inexpensive tool designed to greatly expedite the work of affixing shingles to form a roof. The gauge comprises a bow spring, with limbs extended in the same direction, one limb wedge-shaped and the other perforated to receive screws which attach the gauge to an elongated strip, the limbs being oppositely apertured for a clamping screw. In service two of the devices are used, one affixed to each end of a strip of wood or metal forming a straight edge, made equal in breadth to the weather exposure to be given to the shingles, and of a length convenient to handle, which may be five or six feet.

Agricultural.

SHEAF CARRIER FOR HARVESTERS.— Augustus Jewell, Dowagiac, Mich. This is an attachment for self-binding harvesters for receiving the sheaves when bound and depositing them in bunches or windrows. It consists of an approximately horizontal rock shaft with suitable axial bearings for carrier arms journaled therein, and provided with cranks which have their ends removed from the axis of the rock shaft, there being a set of suitable stationary keepers and a corresponding set of anchorage bars connecting the keepers with the cranks. The beams and supports used for attaching the carrier to different kinds of harvesters will vary with different machines.

CHURN AND BUTTER WORKER. — Eric Silen, Kelso, Washington. This is a churn of the rotary dasher type, with a peculiarly constructed cream agitator, which will afford efficient means to gather and work the churned butter before removal from the churn. The dasher is formed of a spiral web upon a longitudinal shaft, the web of the spiral being pierced with many small apertures, and there being also on the shaft a series of radial beater blades. The dasher is located in the bottom of an elongated churn body, and on being rotated by a hand crank the contents of the churn are propelled toward one end, there being also a return upper current, effecting a constant circulation and efficiently disintegrating the butter globules.

POISON DISTRIBUTER. — Franz L. Richter, Schulenburg, Texas. This is a machine adapted for attachment to and to be drawn along with any form of cultivator, for distributing pulverized Paris green, arsenic, and other poisons in a dry state over cotton and other plants. The body of the machine has a fan section and a powder-receiving section, with means whereby the quantity of powder to be delivered may be regulated. As the machine is drawn along, the revolution of the drive shaft operates the fan and an agitator in the poison receptacle, and the material is blown through delivery spouts to an engagement with shields whence it will fall upon the plants, over which the shields are made to extend.

Miscellaneous.

AUTOMATIC GRAIN SCALE. — Thomas F. Gray, Monroeville, Ohio. This invention covers an improvement on a former patented invention of the same inventor, improving the construction to enable the machine to automatically cut off the supply at a point which will insure an even balance of the scales. Means are also provided for cutting off the supply independently of the operation of the discharge valve, thus enabling the operator to lock the latter valve and test the scales to see if they are accurate, the machine being susceptible of very nice adjustment, and the arrangement of parts being designed to insure its durability and efficiency.

TYPEWRITING MACHINE.—Eugene A. Ford, New York City. This is a machine in which a large number of characters may be printed with few keys, the type bars being made to register accurately. The invention also provides a simple and efficient quick acting carriage-feeding mechanism. The invention consists in the novel combination and arrangement of parts, the free end of the type bar carrying type for producing three letters or characters, either of which may be brought into position for printing by tilting a type bar guide by means of a lever.

RECORDER FOR CASH TILLS.—William W. Darbee, Oneonta, N. Y. This is a simple device arranged to take and keep a record of the amount of money received and placed in the till by different salesmen. It consists of a lever carrying a pawl and adapted to be actuated by the till, a drum carrying a ratchet wheel adapted to be engaged by the pawl, and a fixed bar over which passes the paper to the drum, the paper, as it is drawn over the drum each time the till is opened, being written upon by the operator on an uncovered portion of sufficient size for the record of each transaction.

CHECK, DRAFT, ETC. — William T. Doremus, Flatbush, N. Y. This invention covers an improvement on a former patented invention of the same inventor, to prevent the changing, altering or raising of a check, draft, or other money order or instrument without detection. It consists of a blank having spaces, numerals and words arranged thereon in a manner described, the form being also adapted for the making of blank receipts and requisitions and for the filling up of stock certificates, etc.

FIFTH WHEEL FOR VEHICLES.—James W. Taylor, Vermillion, South Dakota. A hinge connects the fifth wheel with the wagon body, and the reach rod has one end secured in a bearing on the fifth wheel, its rear end turning in a bearing on the rear axle, while there is also a bearing on the reach rod near its forward end from which opposite draught rods extend to the rear axle. The construction relieves the fifth wheel of strain and permits the front wheel to pass over obstructions without seriously affecting the wagon body, insuring easy riding.

CONSTRUCTION OF VESSELS. — Osborn Congelton, Philadelphia, Pa. At each side of the bow, but a short distance back from the stem, a propeller is arranged upon a nearly vertical axis, according to the inclination of the side of the vessel, within suitable recesses provided therefor, suitable gearing being provided to rotate these propellers, with their outer sides moving rearwardly. These propellers are designed not only to propel the boat, but, being reversible and separately operated, are adapted to furnish steering power also.

LEAK STOPPER FOR VESSELS. — Francis F. Jones, Comber, Canada. This invention consists of a breach plate made in sections and hinged together, to pass in a folded position through the opening in the vessel, being more especially designed for rapidly and conveniently closing shot holes or breaches in the bottom or side of a warship or other vessel. Special devices are also provided for releasing the folded sections to permit them to swing into position against the outside of the vessel to close the leak.

WATCHMAN'S TIME RECORDER.— Henry May, Scranton, Pa. A time mechanism revolves a dial upon which are panels representing periods of time, cleats or clamps on the panels holding checks visible through an opening in the cover, which also carries a time lock. The mechanism provides for absolutely determining how long the watchman has remained at a central station and the time he has been absent therefrom, and at what stations he has called and the hour, the lock preventing the dial from being tampered with.

GATE. — Martin McDonough, Winchester, Ill. This invention provides means whereby a gate may be constructed upon a hillside as well as upon level ground, and be positively and conveniently operated from either side. Swinging levers are pivoted at their upper ends to the gate, one of the levers having an adjustable sleeve to which is secured a weighted cord or cable passing over an elevated guide, and the gate rides upon the levers in a horizontal position from its closed to its open position, and *vice versa*, snow or sleet not interfering with its proper manipulation.

FEED BAG SUPPORT. — John W. Pfeiffer, New York City. This support is made with a spiral spring at each side of the bag, through which extends a chain connected with the suspending rope, a fastening device limiting the extension of the spring, so that the support adjusts itself to the amount of feed in the bag, and the bag will be held in position for the horse to conveniently reach the feed, whether there be much or little in the bag.

HOPPLE. — George P. Cole, Saratoga Springs, N. Y. This is a simple and secure fetter adapted for application to two, three, or four feet of the quadruped, as may be desired. It has a self-closing loop at each end and keepers embracing loosely one side or ply of each loop, and secured to the opposite side or ply, whereby the loops may be expanded and contracted without the use of buckles or other fastenings.

HARNESS HOOK.—Quintis V. P. Day, Dinuba, Cal. This invention relates more particularly to an improved check rein hook which will safely hold the check rein and prevent the horse from disengaging it by any movement of his head. The hook has a base portion at the rear end of which is a guard post, a loop attached to the base straddling the hook intermediate of its ends.

MOSQUITO BAR FRAME.—Elbridge G. Holden, Fulton, Texas. According to this invention, vertical bars are secured to the rear side of the head board, sleeves having hinged connections with the upper ends of the bars, while a mosquito bar frame has its side bars sliding in the sleeves. An exceedingly simple frame is thus made which may be easily dropped into a horizontal position over the bed or as easily tipped up and made to slide behind the head board.

PHOTOGRAPHIC SHUTTER.—Frank R. Hoyt, Watkins, N. Y. This is a shutter for instantaneous work, operated by a spring and released by a pneumatic piston. The pivoted and spring-actuated shutter is carried by a support to which is secured a spring catch, its free end engaging a notch of the shutter, the beveled upper end of a piston in a pneumatic cylinder, operated by compressing a hand bulb, engaging a stud of the catch.

ANIMAL TRAP. — Samuel H. Burch, Russellville, Ark. This is a simple, inexpensive, and positively acting trap, especially adapted for catching small animals, such as moles, being very sure to kill them when sprung. The trap has an open base, on one end of which is pivoted a spring-pressed drop plate having spikes on its under side, a lever operating a trigger extending beneath the drop plate, and there being a catch connected with the outer end of the lever, the release of the catch allowing the lever to tip up and permit the drop plate to fall.

VETERINARY PARTURITION HOOK. — Ephraim H. Graves, Appleton, Wis. This hook is hinged to an elongated shank, and a sleeve is held to slide over the joint of the shank and the hook, which may be folded and easily inserted in an animal, and quickly opened and adjusted.

SUPPORT FOR CHAMBER VESSELS.— George R. Rudrof, St. Louis, Mo. This device comprises an extensible frame held to a support, legs being secured to the free end of the frame and a vessel-holding basket suspended from the frame. It may be secured in a commode or any suitable device and adjusted to suit people of different heights.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention and date of this paper.

NEW BOOKS AND PUBLICATIONS.

ELEMENTARY LESSONS IN HEAT. By S. E. Tillman, Professor of Chemistry, U. S. Military Academy. Second edition, revised and enlarged. New York: John Wiley & Sons. 1892. Pp. x, 162. Price $1.50.

This work is prepared to meet the West Point curriculum, and presents in very good form the generalities of its subject. The experimental illustrations are generally such as can be reproduced in lectures, and a collection of forty-six problems is given at the end.

MANUEL PRATIQUE DE PHOTOTYPIE. By J. Voirin. 12mo. 90 pages. Plates and illustrations. Paris. 1892. Ch. Mendel publisher. Price 1 franc 25 centimes.

This little work on phototype illustrations gives a good *resume* of the operations connected with this process, which is better expressed by the term photo-collography. Full directions are given for sensitizing the gelatine and stripping the film. The illustrations are excellent, exhibiting several entirely new forms of apparatus. The first plate, which is a landscape, brings out a remarkable amount of detail and shows conclusively that the process is capable of application to many subjects that are treated in half-tone.

ABROAD AND AT HOME. By Morris Phillips, editor of the *Home Journal*. New York: Brentano.

This pleasant little volume—a traveler's guide book—has a preface written by the well known Mr. A. Oakey Hall, a former mayor of New York, but who has been a resident of London for the past eight years, and it also has a chapter on the restaurants of Paris, by Theodore Child, thus giving additional variety. Mr. Phillips has something interesting to say on quite a range of topics, including especially the good hotels, the solid boarding houses, the means of traveling comfortably, and the best ways of seeing things which well informed people accustomed to living well most desire to see. The "At Home" portion of the volume includes sketches in Georgia, Florida, and California, pleasantly described by Mr. Phillips.

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MAY NUMBER.—(No. 79.)

TABLE OF CONTENTS.

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11. A California residence. Perspective elevation and floor plans. A pleasing design.
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13. Examples of English interior decorations and furnishings. An entrance hall. A Chippendale drawing room.
14. Miscellaneous contents: The white stain or efflorescence on bricks.—Household pests.—The keynote of an auditorium.—Curious foundations.—An Albany house.—To keep iron pipes from rusting.—The Senate chamber new decorations.—Don't turn the exhaust into the sewer.—Floors and their finish.—Bedroom furnishing.—Moderate price screens, illustrated.—Improved hot water heater, illustrated. — French observations on American constructions.—The compensation of architects. — A speaking tube and eariphone, illustrated.—Diamond wall finish.—Fireproofing receipts.—An improved hot water heater, illustrated.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

INDEX OF NOTES AND QUERIES.	No.
Gold, to detect	4268
Vessel, the largest	4269
Spunk	4270
Tempering tools	4272
Horn, to straighten	4273

(4268) R. M. asks: 1. I noticed by some of the papers published in this section of the country, a test for gold ore to detect the presence of gold, as follows: If free oxidized ore, pulverize it and place in a cup. Cover with a solution of iodine and let it stand for about two hours, then try filter paper in it. If it gives a purple color after being burned, it contains gold, and the deeper the color of the paper the richer the ore. Is there anything in the above? Is iodine a solvent for gold? What chemical action takes place? A. The iodine dissolves the gold, and the burning forms a species of "purple of Cassius." 2. What other solvent besides aqua regia is there for gold? A. Chlorine, iodine, bromine, and probably fluorine.

(4269) H. B. asks (1) what *Salix nigra* is and what are its properties. A. The bark or root of *Salix nigra*, black willow, has been used in medicine as a feeble tonic and anti-periodic. 2. Also is there any such thing as magnetic oil of amber, its properties and where can it be got? A. The name is senseless; it may apply to some proprietary preparation. 3. What is the name of the largest vessel ever afloat, and how much water did it draw? Was it not the Great Eastern? A. The Great Eastern of all modern vessels. See our SUPPLEMENT, Nos. 584, 680, 830, for articles about this ship. She drew 28 feet.

(4270) F. T. M. writes: I want to find out about the preparation of agaricus (spunk or amadon); can you recommend me to an authority? A. It is said to be made from dried mushrooms, *Boletus fomentarius* and others, and to adapt it for use as tinder it is soaked in solution of potassium nitrate or chlorate. For a very full account we refer you to the United States Dispensatory, ed. 1886, page 1562.

(4271) "Young America" is mistaken when he states that a platinum rod is required in the dry battery described in "Experimental Science."

(4272) A. E. P. asks: I should be glad to know through the medium of your paper if there is any known remedy for "water cracks" in steel tools tempered in water, especially in the case of rock drills. A. There is no remedy for water cracking of steel in hardening by any special application. The trouble generally originates in the work of forging. Rock drills have corners that become overheated by the carelessness or hurry of the blacksmith. When this has been once done to a drill point, the structure of the steel is changed and the only restorative is to cut off a piece and draw to shape again. Great care should also be taken when heating to harden; a slow fire and time for the heat to become even through the metal should be taken. Dip in water or salt water at as low temperature as the steel will harden. This can be readily known by two or three trials with the quality of steel that you are using. Hardening from too high heat is too often the sole cause of water cracking.

(4273) L. M. asks how to straighten horn, not in its entirety, but say a piece seven inches long by 2½ inches wide, for inlaying work, and which glue would be the best to use, as I am making the top of a horn table? A. Small pieces of horn can be straightened by heating in boiling water and flattening in a press or between clamps in a vise. If it does not stay flat the first time, heat the pieces a little hotter than boiling water, over a fire or in a flame, and put quickly into the press. Sometimes hot oil is used to heat the pieces in, which makes the horn very soft; but as you want to glue the pieces to the table top, it is better to flatten by hot water or dry heat. Good strong brown glue is the best. Roughen the under side of the horn with a coarse rasp before gluing.

R. J. McK. asks how the bulbs of incandescent lamps may be tinted.—B. J. C. asks how laps are charged with diamond dust.—R. L. M. asks: What is the process of etching on steel and copper?—P. W. S. asks: How can I clarify molasses?—A. H. A. says: Will you give me simple rules for chemical nomenclature?—C. S. asks: Have you a formula for the paste used in making paper into pads?—W. N. E. asks: Can you give me information about a benzine pencil?—H. J. F. asks how daguerreotypes may be restored.—B. L. P. asks: How is German silver polished?—C. A. W. writes: I am desirous of making a good and cheap boot powder; can you give me a formula for one?—I. T. T. asks: Can you inform me how soap is mottled?—J. D. G. asks for a formula for lacquer for sheet metal, also matt lacquer?—E. B. L. asks a receipt for a first class mayonnaise dressing for salads, etc.—C. E. M. asks: Where can I obtain formulas for the standard perfumes.—R. H. N. asks for formulas of platinum toning baths.—P. C. T. asks: What is the composition of the greasy paints used by the theatrical profession?

Answers to all of the above queries will be found in the "Scientific American Cyclopedia of Receipts, Notes and Queries," to which our correspondents are referred. The advertisement of this book is printed in another column. A new circular is now ready.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

April 19, 1892,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Advertising sign, W. R. Sanford 473,239
Aerial ship, W. N. Riddle 473,344
Air brakes, compressor for, D. Dunn 473,302
Aluminum or other metals, apparatus for producing, P. Heroult 473,118
Amalgamating apparatus for separating gold and other metals from their ores, G. J. Atkins 473,104
Amalgamating silver ores, A. Janin 473,395
Amalgamator, W. E. Darrow 473,385
Anchor for brick walls, J. M. Van Why 473,273
Animal trap, W. H. Harden 473,312
Annunciator, electrical T. W. Lane 473,121
Armature core for electric motors, D. Pepper, Jr. 473,077
Armature for dynamo-electric machines, S. H. Short 473,363, 473,364
Armature for electric generators or motors, S. H. Short 473,366
Armature ring, D. Pepper, Jr 473,078
Axle cutter, W. A. Pettingill 473,340
Axle, vehicle, Hoeffler & Chapman 473,189
Axles, adjustable nut for, I. J. Trench 473,272
Bag. See Moth proof bag.
Bale ties, machine for making, W. A. Laidlaw 473,321
Baled material, sampling device for, C. S. Hunter 473,316
Baling press, W. A. Laidlaw 473,320
Ballasting device, automatic, B. Halstead 472,994
Barbers' chairs, swivel stand for, A. Kern 473,397
Basket, wire desk, L. G. Beers 473,054
Battery. See Electric battery. Secondary battery.
Bed bottom, S. Bertenshaw 472,978
Bed, folding, L. Sekofsky 473,355
Bed protector, J. P. Duval 473,065
Bee escape for hives, G. H. Ashworth 473,284
Bicycle pedal, F. Sweetland 473,030
Blind stop, Deats & Brown 472,985
Blowpipe, J. N. Peebles 473,197
Boat. See Life boat.
Boiler, G. & J. R. Bolton 473,055
Boiler brace, D. A. Wightman 473,183
Boilers, construction of, W. S. Shipe 473,167
Book, blank, J. W. Burris 473,291
Boot or shoe upper, G. P. Herndon 473,314
Boring and shaping machine, W. J. Smith 473,027
Boring machine, J. Harris 473,153
Bottle and brush, mucilage, H. C. Seward 473,025
Bottle or similar vessel, J. R. Browne 473,379
Bottle stopper, D. H. Talbert 473,031
Box. See Letter box. Music box. Telegraph box.
Box covers, machine for making, G. A. Barnes 473,184
Box fastener, J. Niese 473,436
Brace. See Boiler brace.
Bracket. See Shade bracket.
Brake. See Car brake. Locomotive brake.
Brick and tile cutting machine, R. A. Drawdy 473,301
Bridle, L. D. Jones 473,396
Brush or broom, E. Ehrenberg 472,986
Buckle, suspender, W. A. Springer 473,409
Burner. See Petroleum burner. Vapor burner.
Button hook, J. Van Patten 473,035
Cable grip, E. R. Guerra 473,221
Cable system, J. B. Mahaffey 473,233
Cake cutter, F. R. Woodward 473,281
Camera. See Photographic camera.
Cameras or other purposes, support for, F. Servus 473,357
Candlestick, F. V. Eavanson 473,149
Cane juice, purifying, W. V. Fry 472,989
Cans, machine for capping and seaming the ends of, A. D. Coleman 473,171
Cap, J. E. McLoughlin 473,427
Car brake, E. A. Kinley 473,319
Car coupling, H. R. Dore 473,213
Car coupling. C. Geschwindner 472,992
Car coupling, W. N. Robinson 473,346
Car pilot, railway, H. B. Williams 473,277
Car, safety, A. N. Lamport 473,323
Cars, chain coupling for, J. E. Mullaney 473,014
Cars, gearless motor for electric railway, S. H. Short 473,365
Cars, gearless propelling mechanism for electric railway, S. H. Short 473,368
Cars, holding strap for, H. A. Hartman 473,255
Cars, safety gate for, F. C. Cash 473,210
Cars, sand box for, H. H. Hennegin 473,070
Cars, sanding mechanism for, N. Seibert 473,090
Carcass spreader, G. T. Plumb 473,127
Carding engines, mechanism for grinding the traveling flats of, Dobson & Bromiley 473,187
Carpet sweeper, S. H. Raymond 473,438
Carrier. See Parcel carrier.
Cartridge reloading tool, H. J. Gallup 472,990
Cash dish, D. M. Perine 473,339
Cash register and indicator, T. Carney 473,170
Cash register and indicator, W. G. Douglas 473,172
Castings, method of and apparatus for making metal, W. L. Clark 473,382
Cattle guard, surface, G. W. Miller 473,327
Centrifugal machine, J. Laidlaw 473,322
Chain, drive, C. E. Hart 473,392
Chain elevator, endless, B. Arnold 473,203
Check hook, K. G. Bareis 473,107
Chopper. See Cotton chopper.
Cigarette machine, H. Bauer 473,108
Clasp. See Pen and pencil clasp.
Cleaner. See Slate cleaner.
Clock, calendar, A. M. Lane 473,424
Closet seats, woodworking machine for shaping, F. F. Wichard 473,276
Cloth finishing apparatus, Kirk & Lee 473,398
Clover huller casing, Kailor & Williams 473,259
Clutch, electric, P. W. Willans 473,042
Clutch, pneumatic, J. Brusie 473,380
Coffee mill and storage receptacle, combined self-feeding, F. J. Hollis 473,394
Coin-freed seat, automatic, J. & L. Quittner 473,264
Collar, horse, B. J. Zahn 473,050
Commode, G. E. Shaw 473,360
Commutator brush, G. Meyer 473,195
Compasses, blackboard, H. P. Smith 473,244
Conveyer, spring, O. L. Jones 473,318
Cooker, steam, Sundwall & Blakeslee 473,096
Cooking utensil attachment, P. Lee 473,399
Cord machine, Spaulding & Moore 473,369
Corpses, armrest for, T. Streeter 473,200
Corrugating machine, W. J. Plecker 473,019
Cotton chopper, D. Balshaw 472,975
Couch and cradle, combined folding, W. B. & C. K. Taliaferro 473,181
Coupling. See Car coupling.
Crate for shipping baskets, G. W. Worden 473,047
Cream separator, centrifugal, C. A. Hult 473,005
Crusher. See Meat crusher.
Crushing mill, F. A. Wiswell 473,280
Culinary aeparatus, W. E. Lewis 473,400
Cultivator and weeder, sulky, Z. Breed 473,289
Cultivator, disk, A. G. Hill 473,257
Cultivator shovel, C. A. Anderson 472,970
Curtain supporter and fittings, G. Smith 473,131
Cutter. See Axle cutter. Cake cutter. Meat cutter. Plug cutter.
Dandy roll, Richardson & Pool 473,180
Decorticating jute, ramie, and other fibrous plants, machine for, F. B. Fremerey 472,988
Decorticating ramie, etc., machine for, P. P. Faure 473,110
Desk, school, G. A. Masters 473,074
Die sharpening machine, M. L. Bush 473,249
Digger. See Potato digger.
Distilling apparatus, water, W. Rochlitz 473,164
Ditching machine, D. W. Scott 473,023
Ditching machine, J. J. Wishard 473,279
Dividers, J. W. Beamau 472,977
Docket, record, or similar book, E. C. Fry 473,219
Domestic press, G. W. Pelton 473,407
Door securer, W. W. Ewing 473,305
Drier. See Lumber drier.
Drill. See Grain drill.
Drill operating device, G. H. Summers *et al.* 473,201, 473,202
Drying machine, J. K. Proctor 473,263
Dust pan and support, combined, H. H. Hull 473,004
Electric battery, J. E. Emley 473,386
Electric cable, W. H. Sawyer .... 473,267, 473,351 to 473,353
Electric indicating system and instrument, H. J. Haight 473,174
Electric light support, G. M. Kim 473,229
Electric lock, Crockett & Allen 473,061
Electric machine, dynamo, S. H. Short 473,367
Electric switch, E. H. Johnson 473,228
Electric switch, F. H. Soden 473,132, 473,134
Electric switch, E. P. Warner 473,435
Electric wire conduit, C. H. Wilson 473,044
Electric wire hanger, T. Imeson *et al.* 473,158
Electrical machines, cut-off for, J. P. Woolley 473,282
Electrode, P. L. T. Heroult 473,393
Electrode for use in electro-metallurgical processes, P. Heroult 473,117
Elevator. See Chain elevator.
Elevator, W. Veenschoten 473,036
Elevator controller, Rowntree & Veeder 473,199
Elevator controlling device, H. Rowntree 473,198
Engine. See Gas engine.
Envelope, safety, G. W. Scovill 473,431
Exhibitor, ware, D. G. MacWaters 473,403
Extension table, F. P. Cobham 473,060
Fabrics, machine for cleaning and soaping, E. A. Rusden 473,266
Fan motor, R. Strasser 473,029
Faucet, S. I. Merrill 473,325
Feed rack, G. L. & F. Taft 473,245
Feed trough, J. S. Anderson 472,971
Fence, W. D. & T. J. Snowden 473,092
Fence, iron, R. C., Jr., & W. A. Stewart 473,028
Fence post and wire stretcher, combined, G. M. Williams 473,102
Fence stay, I. K. Hollinger 473,001
File and index, continuous revolving, A. J. Rudolph 473,348
Filters, collecting tube for, G. H. Moore 473,011
Firearm, repeating, F. Rees 473,179
Fire engines, apparatus for igniting fire under steam boiler of steam, G. Case 473,415
Fish lines, leader for, A. M. White 473,038
Fishing rod holder, T. Lemaire 473,073
Flowers, device for preserving dried, F. T. Brown 472,980
Fork. See Hay tedder fork.
Fruit jar, A. Vogt 473,100
Fruit squeezer and strainer, combined, G. Gamlen 473,220
Funnel, R. Rahn 473,081
Furnace, W. Sloan 473,268
Furnace for burning liquid fuel, S. Cox, Jr 473,252
Gauge. See Watchmaker's gauge. Weatherboard gauge.
Gauge, S. F. Brown 473,290
Game apparatus, F. L. Fithian 473,218
Game apparatus, J. W. Hale 473,114
Game apparatus, E. Reisky 473,265
Game apparatus or puzzle, F. L. Fithian 473,217
Garment supporter, E. C. Long 473,232
Gas, apparatus for the manufacture of, G. Scharfe 473,350
Gas engine, J. A. Charter 473,293
Gas from oil, water, etc., apparatus for separating natural, W. Moore 473,013
Gas governors, manufactnre of, Dickson & Hopkins 473,063
Gas retort, Coze & Lencauchez 473,145
Gas retort charger, A. Coze 473,143
Gas retorts, apparatus for charging, Coze & Lencauchez 473,144
Generator. See Steam or hot water generator.
Gold and other metals from their ores, electrolytic apparatus for separating, G. J. Atkins 473,105
Governor for pneumatic motors, automatic, W. D. Parker 473,338
Grain binders, compressor and discharging mechanism for, G. Schubert 473,021
Grain drill, Munn & Christman 473,234
Grater, nutmeg, F. E. Abbott 473,051
Grave marker, J. A. Coffey 473,296
Grubbing machine, C. A. King 473,191
Guard. See Cattle guard. Rand guard.
Gun, magazine, T. J. Thorp 473,370
Hair curler, J. S. Wertsbaugher 473,101
Handle. See Implement handle.
Hanger. See Electric wire hanger.
Harness ornament, Pfiffner & Kriebs 473,079
Harrow, J. I. Hoke 473,155
Harrow, A. Wilfert 473,041
Harrow, disk, R. W. Hardie 473,115
Harrow, sulky spring tooth, T. G. Cook 473,141
Harvester, J. E. Deering 473,300
Harvester and feed cutter, corn, C. C. Fenno 473,111
Harvester, corn, Courtright & Powell 473,298
Harvester, corn, F. Steffen 473,095
Harvester, potato, G. B. Irwin 473,317
Harvester reel, O. Knutson 473,072
Hat brims, machine for curling, T. E. Avery 472,974
Hat rounding machine, C. H. Reid 473,238
Hay rake, J. B. Engstrom 473,416
Hay tedder fork, C. & C. A. Silberzahn 473,243
Heater. See Steam heater.
Heaters, governor for, C. B. Bosworth 473,056
Heating and welding by electricity, H. Howard 473,003
Heating pad, electro-therapeutic, F. H. Soden 473,133
Hide fleshing machine, A. E. Whitney 473,039
Hinge, H. S. Hart 473,175
Hinge, J. Marthaler 473,194
Hinge, J. H. Moore 473,012
Holder. See Fishing rod holder. Plate holder. Sash holder. Spool holder. Ticket holder. Tool or reaper knife holder.
Hook. See Button hook. Check hook. Snap hook. Whiffletree hook.
Horses, overboot for, R. Coates 473,295
Horseshoe with detachable ice calks, Crocker & Bridges 473,384
Hub, bicycle, J. U. Morgan 473,426
Implement handle, M. E. Carleton 473,250
Inhaler and vaporizer, L. B. Hilborn 473,225
Injector, steam, G. Marty 473,010
Insulated magnetic coils, machine for making, C. E. Lipe 473,123
Iron. See Plane iron Trace iron.
Jack. See Lifting jack.
Jar. See Fruit jar.
Joint. See Rail joint.
Knife. See Rotary knife.
Knob attachment, C. Marshall 473,262
Knobs to shanks, machine for attaching, I. I. Smith 473,091
Lacing hooks, machine for making, F. Egge 473,215
Lamp, electric arc, T. E. Adams 473,283
Lamp, electric arc, O. Patin 473,076
Lamp, incandescent electric, A. C. Carey 473,208
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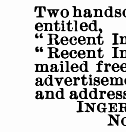

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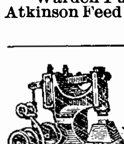

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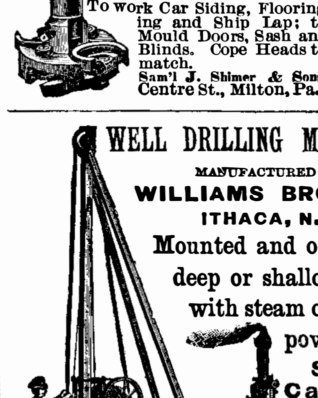

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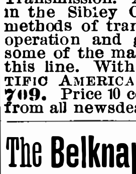

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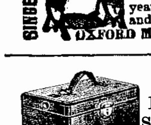

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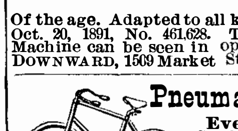

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U. S. ENGINEER OFFICE, CHARLESTON, KANAWHA, W. VA., April 11, 1892.—Proposals for Iron Work for Movable Dams on the Great Kanawha River, embracing about 495,000 pounds of wrought iron and 38,500 pounds of cast iron and two maneuvering winches, will be received at this office until 3 p. m. of May 25, 1892, and then opened. The attention of bidders is invited to the Acts of Congress, approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. Full information can be obtained by application to ADDISON M. SCOTT, Resident Engineer, at the above office. WM. P. CRAIGHILL, Colonel, Corps of Engineers, U. S. A.

PROPOSALS FOR OBSERVATION TOWERS.—Office of the Chickamauga Park Commissioners, War Department, Washington, D. C., April 9, 1892.—Sealed proposals in triplicate, with guarantees and designs, for furnishing six wrought-iron towers, will be received at this office until noon of May 24, 1892, and opened immediately thereafter in the presence of bidders. The right to reject any or all proposals is reserved to the United States. Specifications and blank forms of proposals will be furnished established manufacturers and contractors on application to the Commissioners, J. S. FULLERTON, A. P. STEWART and S. C. KELLOGG.

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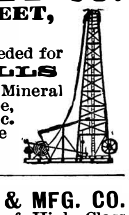

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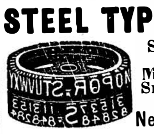

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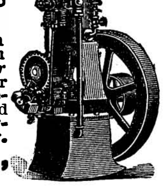

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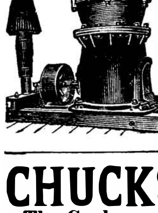

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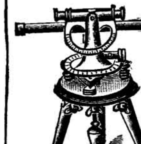

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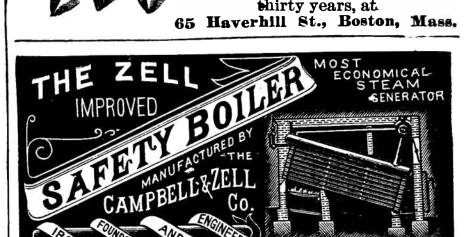

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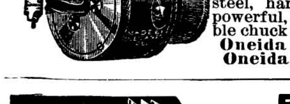

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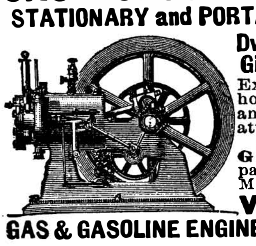

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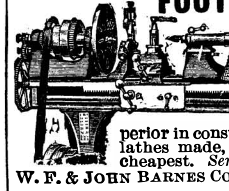

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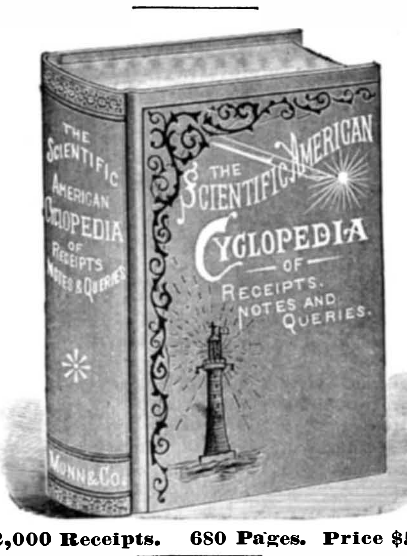

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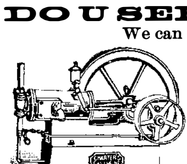

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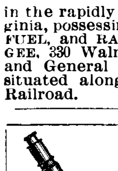

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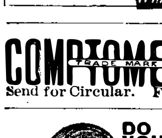

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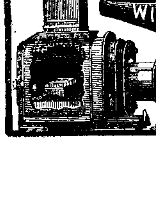

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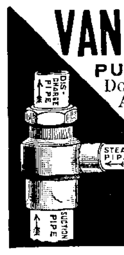

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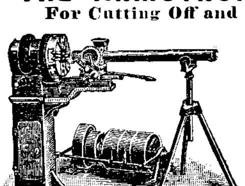

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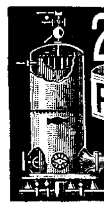

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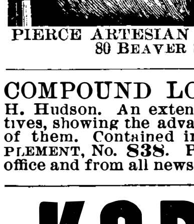

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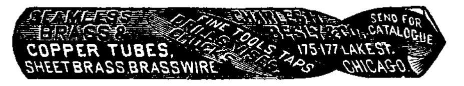

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